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• CTIA wireless conference attendees get serious about WOW PAGE 8
• Former Lotus CEO Jeff Papows: Still outspoken after all [illegible] PAGE 28

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STORAGE



Cheap & Secure Data Stores

SPECIAL REPORT

Storing the company's data jewels has become a high-profile and expensive operation. So turn to our special report and you'll find strategies for cutting long-term costs, securing storage networks and replicating data for disaster recovery. STORIES BEGIN ON PAGE 23.

ONLINE EXCLUSIVES

Read interviews with storage gurus Marc Farley and Bill Peldzus for their insights on today's hottest storage topics.

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COLIN JOHNSON

IT Managers Tackle Windows Server Sprawl

Users eye new virtual server, resource manager software to control their administration costs

BY CAROL SLIWA AND JAIKUMAR VIJAYAN

IT managers trying to cope with the high costs of managing scores or even hundreds of Windows servers — especially grossly underutilized ones — are looking to new options for workload consolidation that could help them rein in ballooning server sprawl.

SYSTEM CONSOLIDATION

Nine of the 14 corporate users interviewed last week by *Computerworld* said they're either deploying or considering the use of emerging virtual server software that will let them run multiple distinct copies of the Windows server operating system on a single Intel-based box.

VMware Inc. in Palo Alto, Calif., currently ships two software-based partitioning products, and Connectix Inc. in San Mateo, Calif., is due to release a product in the first quarter of next year that will also let users carve up the processing power, disk, memory and, potentially, bandwidth of Intel-based boxes.

Few users appear to be aware of another potential workload consolidation option: Microsoft has yet to announce the Windows System Resource Manager, which it plans to ship via a separate CD with its upcoming Windows .Net Server 2003 Enterprise and Datacenter editions. The WSRM software can help users allocate processing power and memory for applications that run on the same copy of Windows.

But many corporate users

Server Sprawl, page 54

Wall St. Leans Toward Linux

Firms replace Unix, Windows to save money, add flexibility

BY LUCAS MEARIAN

With a handful of key Wall Street brokerage firms acting as icebreakers, Linux is quickly gaining ground on Unix and Windows as a mission-critical operating system within the securities industry. The attractions: its flexibility across systems and the savings it yields through the use of commodity hardware.

"The list of people in the queue who are saying 'When I have a new project, I'm going

Linux, page 14

The Linux Appeal

- Linux clusters provide supercomputer-type performance at a fraction of the expense.
- Linux has lower licensing fees than Unix, Windows NT and other operating systems.
- It's able to run on a range of hardware, allowing cheaper alternatives to proprietary hardware.
- It reduces leverage that large vendors have traditionally exercised by closely coupling hardware and operating systems.
- It enhances competition and promotes an open environment and vendor neutrality.

SOURCE: TOWER GROUP

Microsoft Standardizes Support Plans

Some users may have problems with NT 4 support end date

BY CAROL SLIWA

Corporate IT managers planning for the long term received good news from Microsoft Corp. last week, when the software maker clarified how long it would provide support for its products. For most products, Microsoft vowed to provide support for at least five years.

But Microsoft didn't extend the support end date for Windows NT 4 Server beyond the end of next year. That could put some corporate users at risk, according to Mike Silver, an analyst at Gartner Inc. in Stamford, Conn. Silver said Gartner had expected Microsoft to extend that date.

Instead, Microsoft merely waived the fees that were due to be charged next year for

Support Plans, page 54

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The future of Microsoft products: designing and engineering for maximum security

Microsoft has implemented engineering standards and processes that focus on building greater security into our products during design and development. Some highlights of the new processes include:

- Creating stronger default policies on all software, and fewer services enabled by default, to deliver software solutions that are more secure by default
- Performing exhaustive cross-team security code reviews to help identify and address potential vulnerabilities before the software is released
- Developing and refreshing new threat models to help counter constantly evolving security risks

Unisys security services, partnered with Microsoft products and solutions, provide our customers with highly secure and cost-effective mission-critical solutions."

—Sunil Misra, Managing Principal, Worldwide Security Practice, Unisys

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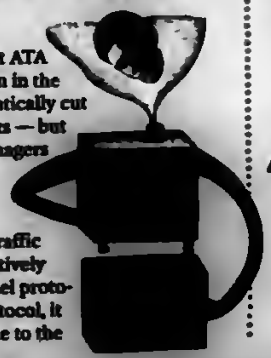
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ONLINE: One user figures that cobbling together open storage subsystems may be cheaper in the long run than being tied to a proprietary vendor. QuickLink 32801

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ONLINE: Vendors such as Brocade, Cisco and FalconStor are trying to address storage security issues in their product lines. QuickLink 32900



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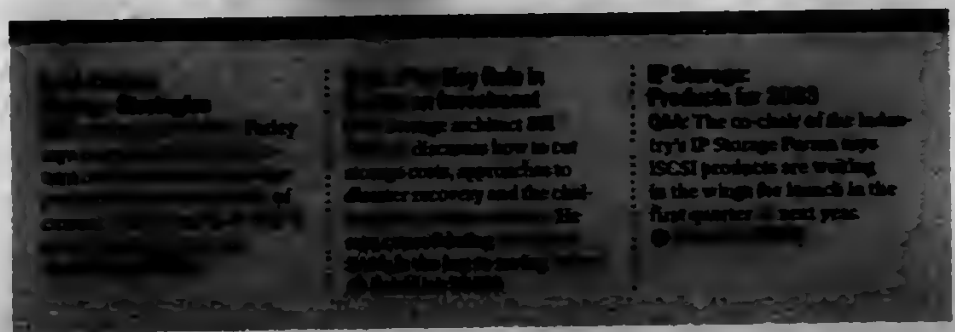
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IP Storage: Products for 2003
Q&A: The co-chair of the industry's IP Storage Forum says iSCSI products are waiting in the wings for launch in the first quarter of next year.

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Cost-Cutting Storage Strategies
Q&A: Storage guru Marc Farley says companies seeking a return on investment on storage projects need to keep track of current storage costs, or they'll never know the payback.
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SANs Play Key Role in Return on Investment
Q&A: Storage architect Bill Peldzus discusses how to cut storage costs, approaches to disaster recovery and the challenges of storage security. He says consolidating storage on SANs is the key to saving money.
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IP Storage: Products for 2003
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AT DEADLINE

Sun Reports Loss, Plans Layoffs

Sun Microsystems Inc. reported a net loss of $111 million on revenue of $2.7 billion for the quarter that ended Sept. 29.

The company said it will lay off approximately 11% of its employees in a move that will cost $300 million in the current quarter. The revenue shortfall caused by the "protracted economic downturn" has offset Sun's previous efforts to contain costs, said Steve McGowan, the company's chief financial officer.

Dell Regains PC Market Lead

Dell Computer Corp. has fended off the combined might of Hewlett-Packard Co. and Compaq Computer Corp. to regain its spot as the world's leading PC vendor, according to data published Oct. 17 by both Gartner Inc. and IDC. The research firms place Dell at the top of the PC market based on worldwide shipments for the third quarter. Dell was the only top-tier vendor to gain market share in the quarter, according to Gartner.

Short Takes

RECREATIONAL EQUIPMENT INC. in Seattle said it has standardized on IBM WebSphere e-commerce applications. . . . The Bush administration's push for improved federal IT management is accelerating U.S. spending on enterprise resource planning (ERP) systems, according to INPUT, a market research firm in Chantilly, Va. ERP spending is expected to increase from $3.5 billion this year to more than $6 billion in 2007, Input reported. . . . The U.S. NATIONAL COMMUNICATIONS SYSTEM plans to develop a Global Early Warning Information System to monitor the performance of the Internet and warn government and industry users about threats that could degrade service. . . . Content delivery vendor AKAMAI TECHNOLOGIES INC. in Cambridge, Mass., said it will reduce its 700-person workforce by about 29%.

Energy Trading to Rebound, Say Experts

Turnaround predicted for next year, despite Dynegy's exit from market

BY THOMAS HOFFMAN

DYNEGY INC.'S plan to discontinue energy trading is the latest blow to an online market that not long ago was heralded as a poster child for the potential of e-commerce.

But Houston-based Dynegy's announcement last week isn't expected to quash the market. In fact, the recent entrance of financial industry players such as Bank of America Corp., The Goldman Sachs Group Inc. and Morgan Stanley Dean Witter & Co. is expected to stabilize the market. Also adding stability is a forthcoming regulation that would allow the wholesale electricity market to operate on a national basis.

"My qualitative assessment is that [trading] volumes have gone down dramatically," said James Walker, an analyst at Forrester Research Inc. in Cambridge, Mass.

That conclusion is supported by Daniel Miklovic, a Gartner Inc. analyst based in Seattle. He agrees that the trading market is "absolutely down" from its zenith roughly 18 months ago. Neither analyst could quantify online energy trading volumes, since companies that participate in the market typically don't publish those figures.

However, both Walker and Miklovic maintain that traditional banking players that have entered the market have added some liquidity to it and may even help the industry.

"Most [energy] producers got in over their heads when they tried to become traders," said Miklovic. "While volumes by banks are lower today than during the [market's] heyday, they will pick up."

Energy trading should get an additional boost from a pending regulation being crafted by the Federal Energy Regulatory Commission (FERC). The regulation, called the Standard Market Design, is meant to make it possible for U.S. consumers to shop for electricity from suppliers nationwide.

Standard Market Design, which is on course to go into effect early next year, should help stabilize the energy industry, including the online energy trading sector, said Walker. Even so, he said he doesn't expect volumes in online energy trading to see a significant uptick until late next year.

A spokesman for Dynegy said it's too sooo to tell how many employees will be affected by the closing of its energy trading operations. He also declined to speculate on what steps the company might take to shed the IT assets used to support its trading business or the size of the charge that Dynegy might take against future earnings. Dynegy's stock closed Oct. 16 at 81 cents per share, down from its 52-week high of $47.20. ▶

SMD: A Priority for Business or IT?



SOURCE: FORRESTER RESEARCH INC., CAMBRIDGE, MASS., OCTOBER 2002

Financial Services Firms Rally for IM Standards

BY TODD R. WEISS

With instant messaging (IM) growing in importance as a tool for business, seven Wall Street financial services companies have joined forces to try to pressure vendors to standardize the software for compatibility.

In an announcement last week, the firms said they have formed the Financial Services Instant Messaging Association (FIMA) to work with IM software vendors on interoperability, user authentication, security and audit-trail needs in the products.

Ursula Mills, a spokesman for London-based UBS Warburg and co-chairman of FIMA, said the problem is that the companies' employees and customers typically use different IM clients. Since those clients aren't compatible, employees need to have multiple IM applications running on their computers, wasting resources and complicating communications, she said.



In the long term, the group plans to press vendors for software that uses uniform protocols for compatibility, with one sign-on for access to all of the IM clients. In the meantime, FIMA hopes to see vendors working together on gateways that allow interoperability until protocols are established and followed.

Analysts said the group could have the clout to make compatibility happen.

"I think this makes a tremendous amount of sense," said Michael Osterman, president of Osterman Research Inc. in Black Diamond, Wash. "Industry associations like this putting the pressure on, I think, is a great idea.

"The growth of IM is continuing, but its real growth is being hampered by the lack of interoperability," he said.

Robert Mahowald, an analyst at IDC in Framingham, Mass., agreed. "When you've got money behind an initiative, it's amazing the kinds of results and pressure you get," he said. "Because the financial services industry is an early adopter, they've got some clout."

The problem, he said, is that IM interoperability isn't a technical issue for IM vendors. "It's a business issue," he said. And what's important to them, Mahowald said, is how they will be able to make money from their investments in IM technologies.

FIMA members include UBS, Credit Suisse First Boston Corp., Deutsche Bank AG, J.P. Morgan Chase & Co., Lehman Brothers Holdings Inc., Merrill Lynch & Co. and Morgan Stanley Dean Witter & Co. ▶

ROI Takes Center Stage at CTIA Show

Conference's focus has shifted from latest technologies to financial returns

BY BOB BREWIN
LAS VEGAS

Gee-whiz wireless technology took a back seat to projects that quickly deliver bottom-line results at the Cellular Telecommunications & Internet Association (CTIA) Wireless IT and Internet 2002 Conference here last week.

Tom Wheeler, president and CEO of the Washington-based CTIA, the wireless industry's trade association, kicked off the conference with a session focused on wireless projects that show a quick and demonstrable return on investment. Gone was the emphasis on overhyped technologies, such as mobile commerce, that have characterized past CTIA conferences.

Adel Al-Saleh, general manager of IBM's Global Wireless e-business unit, said in his keynote speech that technology companies must demoostrate a clear ROI to customers planning to deploy wireless systems. To help them make these decisions, Al-Saleh said, IBM has developed a tool called the Wireless ROI Predictor, which helps calculate how quickly a customer can get a return on an initial project investment.

Wireless Projects

Bob Eardley, senior director of IT transformation solutions at Air Canada in Montreal, said he used the Wireless ROI Predictor before starting a project called e-Toolbox, which was designed to provide mechanics with wireless access to aircraft maintenance manuals and diagrams. The system runs on legacy systems housed on IBM 390 mainframes.

Eardley said Air Canada tested the e-Toolbox system this spring at the Montreal Dorval International Airport and plans to deploy it systemwide during the next 18 months.

He said e-Toolbox provides mechanics with quick access from the gate or tarmac to the information they need to make an aircraft repair, which in turn results in fewer cancellations, improved material management, better maintenance planning and an increase in productivity. Eardley estimates that the system will "return benefits in the millions of dollars a year."

IBM, which has a long-term strategic relationship with Air Canada, developed a Web-based viewer that allows line mechanics to quickly access the legacy data, Eardley said.

The mechanics access the data over industry-standard 802.11b, or Wi-Fi, wireless connections from rugged PCs housed in the cabs of their vehicles. All data sent over the LAN is encrypted, Eardley said, adding that Air Canada and IBM are working on another project to add digital signatures to the job orders that mechanics complete.

IBM and Air Canada plan to sell e-Toolbox to other air carriers, a move Eardley believes has a good chance of success, since few carriers have mastered the problem of remotely accessing legacy data.

Although e-Toolbox required complex integration with back-end systems, Citigroup Inc. in New York found that tapping into the simplest form of wireless data — Short Messaging Service (SMS) messages of 160 characters or less — can provide a quick ROI. Alan Young, vice president of emerging technology at Citigroup's corporate technology office, said customers in Poland were overwhelming the company's call centers twice a month to check on whether their paychecks had been deposited.



Young said Citigroup could-o't afford to adjust staffing at the call centers on a daily basis to handle such spikes, so the company worked with Oracle Corp. to develop an SMS alert feature that delivers customer balances daily. The approach was made easier by heavy penetration of wireless technology in Poland and the fact that all Polish carriers adhere to the Global System for Mobile Communications standard.

After launching the bank balance service in Poland, Citigroup rolled it out in India, another country where balance inquiries threatened to overwhelm call centers.

The bottom line, said Young, is a significant savings. Citigroup receives 1.5 million calls per day from customers worldwide. "Answering each of those calls costs dollars," Young said, whereas the cost of sending an SMS message is measured in cents.

New Apps Give New Life to Mainframes

IBM support for Linux applications leading trend

BY JAIKUMAR VIJAYAN

Far from being relegated to the scrap yard, mainframe systems are increasingly being used to run new application workloads, according to a recent report from Giga Information Group Inc. in Cambridge, Mass.

Driving the trend are the economic pressure tn make better use of existing IT investments and factors such as the availability of lower-cost systems and the increasing support for Linux applications and newer workloads from IBM, according to Giga.

More than 70% of the mainframe MIPS shipped so far this year are in support of new workloads such as Linux, IBM's WebSphere, BEA Systems Inc.'s WebLogic, and enterprise resource planning software from companies such as PeopleSoft Inc. and SAP AG, according to Giga.

Much of the Linux activity has stemmed from IBM's growing support for the open-source operating system oo its mainframes. According to Giga, there are currently at least 500 mainframe Linux installations, with around 150 more in production status. Going forward, expect to see more companies using zSeries Linux environments for application serving combined with back-end database serving residing in a zSeries z/OS environment, Giga predicted. The launch earlier this year nf mySAP.com on SuSE Linux AG's 64-bit Linux for zSeries is one of the first steps toward enabling this, the report said.

Meanwhile IBM's lower-cost z800 mainframes, which launched last year, have been successful in snagging Java 2 Enterprise Edition-based workloads such as WebSphere and WebLogic.

The trend isn't surprising, said Mike Kahn, an analyst at The Clipper Group Inc. in Wellesley, Mass.

"There are certain costs-of-ownership benefits in running these new workloads if you already have a large mainframe environment," Kahn said.

And by its pricing on hardware and software configurations, IBM has also made it very attractive to run new workloads, he added.

"IBM is attempting to keep applications from migrating away from the mainframe by allowing users to extend them to new areas," Kahn said.

While a lot of the new mainframe MIPS are being purchased by users who are deploying new applications, it would be a mistake to assume that all of the additional capacity is being devoted entirely to these workloads, said David Floyer, an analyst at IT Centrix Inc., a consultancy in Framingham, Mass.

"I would draw a slightly more cautious conclusion," Floyer said. "The vast majority of MIPS are still doing core business work, and that is going to continue being the case."

Boosts for Big Iron

Key drivers for mainframe growth:

- Current economy forces companies to revisit total cost of ownership models that favor more centralized, cost-efficient computing structures
- IBM's introduction of the z800, which offers a competitive alternative to Sun Microsystems Inc. and Hewlett-Packard Co. servers for those looking to upgrade from earlier CMOS mainframes
- Enhanced Linux support
- Performance enhancements on mainframe J2EE-based products such as WebSphere and WebLogic

SOURCE: GIGA INFORMATION GROUP INC., CAMBRIDGE, MASS.

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That conclusion is supported by Daniel Miklovic, a Gartner Inc. analyst based in Seattle. He agrees that the trading market is "absolutely down" from its zenith roughly 18 months ago. Neither analyst could quantify online energy trading volumes, since companies that participate in the market typically don't publish those figures.

However, both Walker and Miklovic maintain that traditional banking players that have entered the market have added some liquidity to it and may even help the industry.

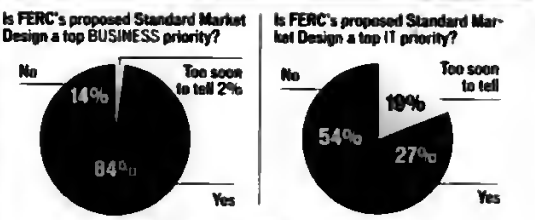
"Most [energy] producers got in over their heads when they tried to become traders," said Miklovic. "While volumes by banks are lower today than during the [market's] heyday, they will pick up."

Energy trading should get an additional boost from a pending regulation being crafted by the Federal Energy Regulatory Commission (FERC). The regulation, called the Standard Market Design, is meant to make it possible for U.S. consumers to shop for electricity from suppliers nationwide.

Standard Market Design, which is on course to go into effect early next year, should help stabilize the energy industry, including the online energy trading sector, said Walker. Even so, he said he doesn't expect volumes in online energy trading to see a significant uptick until late next year.

A spokesman for Dynegy said it's too soon to tell how many employees will be affected by the closing of its energy trading operations. He also declined to speculate on what steps the company might take to shed the IT assets used to support its trading business or the size of the charge that Dynegy might take against future earnings. Dynegy's stock closed Oct. 16 at 81 cents per share, down from its 52-week high of $47.20. ▶

SMD: A Priority for Business or IT?



BASE: 37 NORTH AMERICAN UTILITY MANAGERS INVOLVED WITH TRANSMISSION OPERATIONS AND IT

Financial Services Firms Rally for IM Standards

BY TODD R. WEISS

With instant messaging (IM) growing in importance as a tool for business, seven Wall Street financial services companies have joined forces to try to pressure vendors to standardize the software for compatibility.

In an announcement last week, the firms said they have formed the Financial Services Instant Messaging Association (FIMA) to work with IM software vendors on interoperability, user authentication, security and audit-trail needs in the products.

Ursula Mills, a spokesman for London-based UBS Warburg and co-chairman of FIMA, said the problem is that the companies' employees and customers typically use different IM clients. Since those clients aren't compatible, employees need to have multiple IM applications running on their computers, wasting resources and complicating communications, she said.

Standards Wanted

Seven financial services companies are pushing IM vendors for:

- **Standards-based interoperability across IM clients**
- **Security and audit trail features for business**
- **User authentication capabilities**

In the long term, the group plans to press vendors for software that uses uniform protocols for compatibility, with one sign-on for access to all of the IM clients. In the meantime, FIMA hopes to see vendors working together on gateways that allow interoperability until protocols are established and followed.

Analysts said the group could have the clout to make compatibility happen.

"I think this makes a tremendous amount of sense," said Michael Osterman, president of Osterman Research Inc. in Black Diamond, Wash. "Industry associations like this putting the pressure on, I think, is a great idea.

"The growth of IM is continuing, but its real growth is being hampered by the lack of interoperability," he said.

Robert Mahowald, an analyst at IDC in Framingham, Mass., agreed. "When you've got money behind an initiative, it's amazing the kinds of results and pressure you get," he said. "Because the financial services industry is an early adopter, they've got some clout."

The problem, he said, is that IM interoperability isn't a technical issue for IM vendors. "It's a business issue," he said. And what's important to them, Mahowald said, is how they will be able to make money from their investments in IM technologies.

FIMA members include UBS, Credit Suisse First Boston Corp., Deutsche Bank AG, J.P. Morgan Chase & Co., Lehman Brothers Holdings Inc., Merrill Lynch & Co. and Morgan Stanley Dean Witter & Co. ▶

ROI Takes Center Stage at CTIA Show

Conference's focus has shifted from latest technologies to financial returns

BY BOB BREWIN

Gee-whiz wireless technology took a back seat to projects that quickly deliver bottom-line results at the Cellular Telecommunications & Internet Association (CTIA) Wireless IT and Internet 2002 Conference here last week.

Tom Wheeler, president and CEO of the Washington-based CTIA, the wireless industry's trade association, kicked off the conference with a session focused on wireless projects that show a quick and demonstrable return on investment. Gone was the emphasis on overhyped technologies, such as mobile commerce, that have characterized past CTIA conferences.

Adel Al-Saleh, general manager of IBM's Global Wireless e-business unit, said in his keynote speech that technology companies must demonstrate a clear ROI to customers planning to deploy wireless systems. To help them make these decisions, Al-Saleh said, IBM has developed a tool called the Wireless ROI Predictor, which helps calculate how quickly a customer can get a return on an initial project investment.

Wireless Projects

Bob Eardley, senior director of IT transformation solutions at Air Canada in Montreal, said he used the Wireless ROI Predictor before starting a project called e-Toolbox, which was designed to provide mechanics with wireless access to aircraft maintenance manuals and diagrams. The system runs on legacy systems housed on IBM 390 mainframes.

Eardley said Air Canada tested the e-Toolbox system this spring at the Montreal Dorval International Airport and plans to deploy it systemwide during the next 18 months.

He said e-Toolbox provides mechanics with quick access from the gate or tarmac to the information they need to make an aircraft repair, which in turn results in fewer cancellations, improved material management, better maintenance planning and an increase in productivity. Eardley estimates that the system will "return benefits in the millions of dollars a year."

IBM, which has a long-term strategic relationship with Air Canada, developed a Web-based viewer that allows line mechanics to quickly access the legacy data, Eardley said.

The mechanics access the data over industry-standard 802.11b, or Wi-Fi, wireless connections from rugged PCs housed in the cabs of their vehicles. All data sent over the LAN is encrypted, Eardley said, adding that Air Canada and IBM are working on another project to add digital signatures to the job orders that mechanics complete.

IBM and Air Canada plan to sell e-Toolbox to other air carriers, a move Eardley believes has a good chance of success, since few carriers have mastered the problem of remotely accessing legacy data.

Although e-Toolbox required complex integration with back-end systems, Citigroup Inc. in New York found that tapping into the simplest form of wireless data — Short Messaging Service (SMS) messages of 160 characters or less — can provide a quick ROI. Alan Young, vice president of emerging technology at Citigroup's corporate technology office, said customers in Poland were overwhelming the company's call centers twice a month to check on whether their paychecks had been deposited.

Young said Citigroup couldn't afford to adjust staffing at the call centers on a daily basis to handle such spikes, so the company worked with Oracle Corp. to develop an SMS alert feature that delivers customer balances daily. The approach was made easier by heavy penetration of wireless technology in Poland and the fact that all Polish carriers adhere to the Global System for Mobile Communications standard.

After launching the bank balance service in Poland, Citigroup rolled it out in India, another country where balance inquiries threatened to overwhelm call centers.

The bottom line, said Young, is a significant savings. Citigroup receives 1.5 million calls per day from customers worldwide. "Answering each of those calls costs dollars," Young said, whereas the cost of sending an SMS message is measured in cents.

E-TOOLBOX

Air Canada's Wireless Project

mechanics with access to repair manuals and schematics hosted by legacy systems over a wireless LAN

cancellation and improves material management and productivity

in Montreal and is being rolled out systemwide over the next 18 months

in partnership with IBM, using the IBM Wireless ROI Predictor

savings estimated in millions of dollars a year

New Apps Give New Life to Mainframes

IBM support for Linux applications leading trend

BY JAIKUMAR VIJAYAN

Far from being relegated to the scrap yard, mainframe systems are increasingly being used to run new application workloads, according to a recent report from Giga Information Group Inc. in Cambridge, Mass.

Driving the trend are the economic pressure to make better use of existing IT investments and factors such as the availability of lower-cost systems and the increasing support for Linux applications and newer workloads from IBM, according to Giga.

More than 70% of the mainframe MIPS shipped so far this year are in support of new workloads such as Linux, IBM's WebSphere, BEA Systems Inc.'s WebLogic, and enterprise resource planning software from companies such as PeopleSoft Inc. and SAP AG, according to Giga.

Much of the Linux activity has stemmed from IBM's growing support for the open-source operating system on its mainframes. According to Giga, there are currently at least 500 mainframe Linux installations, with around 150 more in production status. Going forward, expect to see more companies using zSeries Linux environments for application serving combined with back-end database serving residing in a zSeries z/OS environment, Giga predicted. The launch earlier this year of mySAP.com on SuSE Linux AG's 64-bit Linux for zSeries is one of the first steps toward enabling this, the report said.

Meanwhile IBM's lower-cost z800 mainframes, which launched last year, have been successful in snagging Java 2 Enterprise Edition-based workloads such as WebSphere and WebLogic.

The trend isn't surprising, said Mike Kahn, an analyst at The Clipper Group Inc. in Wellesley, Mass.

"There are certain costs-of-ownership benefits in running these new workloads if you already have a large mainframe environment," Kahn said.

And by its pricing on hardware and software configurations, IBM has also made it very attractive to run new workloads, he added.

"IBM is attempting to keep applications from migrating away from the mainframe by allowing users to extend them to new areas," Kahn said.

While a lot of the new mainframe MIPS are being purchased by users who are deploying new applications, it would be a mistake to assume that all of the additional capacity is being devoted entirely to these workloads, said David Floyer, an analyst at IT Centrix Inc., a consultancy in Framingham, Mass.

"I would draw a slightly more cautious conclusion," Floyer said. "The vast majority of MIPS are still doing core business work, and that is going to continue being the case."

Boosts for Big Iron

Key drivers for mainframe growth

- Current economy forces companies to revisit total cost of ownership models that favor more centralized, cost-efficient computing structures
- IBM's introduction of the z800, which offers a competitive alternative to Sun Microsystems Inc. and Hewlett-Packard Co. servers for those looking to upgrade from earlier CMOS mainframes
- Enhanced Linux support
- Performance enhancements on mainframe J2EE-based products such as WebSphere and WebLogic

BRIEFS

IT Pros Satisfied With Vendors, but...

... only 47% of IT customers feel loyalty to the vendors they work with, and nearly one-third (29%) said they feel trapped into continuing to use a vendor's products. That's according to a survey of 2,259 IT professionals by Walker Information Inc. in Indianapolis. Although 80% of the respondents said they were "very satisfied" or "satisfied" with their vendors, only 61% rated the overall quality of suppliers' products as "excellent" or "very good."

WAN Monitoring Tool Makes Debut

Network Instruments LLC in Minneapolis today is announcing the addition of a wide-area network analyzer as part of its Observer 8 line of monitoring products. The new feature provides WAN, LAN and wireless LAN network monitoring and analysis from a single console. Pricing starts at $13,000 for a portable system and $7,000 for a rack-mounted version.

WebFocus Updated

Business intelligence software maker Information Builders Inc. in New York last week announced enhancements to its WebFocus Financial Reporting Platform. They include a new graphic modeling interface, improved integration with Excel and popular enterprise resource planning financial applications, and increased forecasting capabilities. The product will be available Nov. 15. Pricing starts at $21,000.

Short Takes

San Francisco-based SALESFORCE.COM INC. named former Ariba Inc. executive Jim Steele its president of worldwide operations. ... DELL COMPUTER CORP. said it will use Houston-based BMC SOFTWARE INC.'s enterprise management software. Dell will use only BMC, replacing several systems management products.

MARK HALL ▪ ON THE MARK

Siebel-Bashing Shows No Sign of Abating ...

... what with the embarrassing report from Nucleus Research Inc. on the ROI of Siebel's reference accounts [QuickLink 33196]. The steady drumbeat of critical editorials [QuickLink 33244]. The pitiful IT spending on brawny CRM implementations these days. And the abandonment of Siebel Systems Inc. by some of its loyal users. **These are the company's darkest days.** Longtime Siebel user Thomas Wong, vice president of marketing at Gomez Inc. in Waltham, Mass., reluctantly switched to Salesforce.com Inc.'s online sales force automation service, which cost half as much as a mere features upgrade to his 3-plus-year-old Siebel installation. And Salesforce.com was in full use in only 60 days. Money and time are well and good, but Wong also wants the ability to link accounts receivable (AR) information with other Salesforce.com data. Mark Benioff, the San Francisco-based service provider's CEO, says an AR module with billing, payment, contract and other information will be ready for beta users in December. When it goes live, it will be available in at least eight languages and currencies. Despite his defection, Wong still wishes Siebel and its eponymous CEO well. After all, he says, "I read both of Tom's books." ● Last week's item on the demise of tape for backup brought this comment from Quantum Corp. Director Dave Kenyon: "Tape replacement is not going to happen." Then he provided details on the company's new **4TB disk-to-disk DX30 backup** system. It hits the street by month's end, and by the end of the quarter a software update will let users incrementally add many terabytes of more backup capacity. Long live tape. (Wink, wink. Nudge, nudge.) ● **Careful readers of this newspaper remember CueCat,** the none-too-soon departed bar-code technology that some print publications, including this one, used to link dead trees to bits in cyberspace. "It failed because it was not mobile-focused," claims Robert Brodo, founder and executive vice president of LScan Technologies Inc. in Conshohocken, Pa. "Bar codes are meant for PDAs and cell phones." Trouble is, bar-code readers are pricey add-ons to these devices and few people need or pay for them. But a handful of companies do, particularly when they are prodded by Uncle Sam, as are the pharmaceutical outfits to improve on drug safety (*http://www.fda.gov/bbs/topics/NEWS/2002/NEW00821.html*). By next summer, LScan will release ClinicaLScan for Windows CE devices, which will marry the Web, PDAs, bar-code technology and clinical trials drug-testing data in one happy package ▪ EKM Corp. in Encinitas, Calif., is another vendor that's latched on to the FDA's oversight of drug development. At next month's Bio-IT World conference in San Diego, the 2-year-old startup will release LabTrack 2.0, which keeps a functional lab notebook that's fully compliant with procedural requirements set by the government, so IT can offer an alternative to paper-based systems in use today. A big plus with this release is that it's also compliant with the Federal Rules of Evidence standards for electronic data, and **given the endless series of lawsuits in the pharma industry,** it might prove all too useful. ● Integrated Research Ltd. in North Sydney, Australia, will ship Prognosis 7.07 this December. The upgrade to the systems and applications management tool will be able to sniff packets so network performance information can be correlated with online transaction data so IT staff can get precise analysis of end-to-end e-commerce operations. The new version also will include agents to monitor LDAP and DNS servers and improved systems management tools for Linux, among other improvements.



NIPC Loses One of Its Own to 'Beltway' Sniper

BY DAN VERTON
FAIRFAX, VA.

The hunt for the Washington-area sniper got personal last week for members of the FBI's cybersecurity division after one of their own became the latest victim in a killing spree that has claimed nine lives since Oct. 2.

Linda Franklin, a 47-year-old intelligence operations specialist at the FBI's National Infrastructure Protection Center (NIPC), was killed last week in Falls Church, Va. Her death is the latest in a series of random, sniperlike shootings that have sent fears of terrorism rippling through the communities where tens of thousands of government employees and high-tech industry executives live and work.

Franklin is remembered by colleagues at the NIPC not only as a "key asset" on the NIPC's analytical staff, but also as a great wife and friend. A cancer survivor, she underwent a mastectomy last October, and even before she was fully healthy she would invite others who had undergone similar surgery into her home for care.

"She would have as many as six people stay with her in a two-bed, two-bath house, plus maybe a half-dozen pets," said Paul Hulseberg, a former computer scientist at the NIPC and a longtime colleague and close friend of Franklin's. Hulseberg, whose work cubicle was located directly across from Franklin's, remembers her as being instrumental in getting the FBI's InfraGard program off the ground. InfraGard is the bureau's nationwide program for cyberthreat information sharing with the private sector.

"She worked many, many long days and weekends on that program," Hulseberg said.

Franklin had been at the NIPC for three and a half years, joining just as the cybersecurity unit was being formed. The NIPC is responsible for detecting and analyzing cyberthreats to the nation's critical computer systems and infrastructures, such as the telecommunications grid and electric power systems, and then warning government agencies and the private sector about those threats.

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Michael Touchstone
Manager of Energy Conservation,
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Congress Examines Impact Of ECNs on Stock Markets

Advocates tout innovative use of electronic nets

BY PATRICK THIBODEAU
WASHINGTON

Electronic communications network (ECN) operators defended themselves before Congress last week, pointing to their economic advantages, while critics said they skirt the law.

ECNs are systems that electronically connect buyers and sellers of equities. They rely on high-speed networks and systems to conduct trades and have emerged into prominence during the past several years. For example, they handle 40% of the trades on the Nasdaq Stock Market, according to industry executives who spoke at a congressional committee meeting here.

ECN technology has significant advantages for financial traders, say supporters. One ECN, NYFIX Millennium LLC, was formed by NYFIX Inc. in Stamford, Conn., and 10 U.S. investment banks and went live just before last year's terrorist attacks. It matches buyers and sellers of stocks, bonds and other financial instruments almost instantly — within 100 to 150 milliseconds. If the traders can't immediately improve on the price listed on the New York Stock Exchange, the trade is sent to the NYSE for execution, according to NYFIX CEO Robert Gasser.

"ECNs must earn their keep by innovating," said Kevin Foley, CEO of Bloomberg Tradebook LLC, an ECN based in New York.

ECN owners recognize that they have ruffled some feathers. The networks "present serious competitive challenges to the established market center," said Foley at last week's hearing before the Subcommittee on Commerce, Trade and Consumer Protection.

And the way these systems interact with other data-sharing systems is an issue. Of particular concern at the hearing was the Intermarket Trading System, a more than 20-year-old system linking the nation's stock markets. Foley called it the technological relative of the eight-track player.

Breaking the Rules?

However, Michael Ryan, an executive vice president at the American Stock Exchange, was critical of one ECN, The Island ECN Inc., for not publicly displaying orders in the consolidated quotation system. Ryan told the committee that Island is violating the U.S. Securities and Exchange Commission's (SEC) alternative trading system rules.

But a spokeswoman for Island disputed that and said the New York-based company isn't violating any rules.

Damon Kovelsky, an analyst at Meridien Research Inc. in Newton, Mass., said participating in the consolidated quote system may slow down an ECN. "The way trades occur now is not the way they occurred 10 to 15 years ago," he said. "Rules and regulations have not kept up to speed."

This was the second hearing held on ECNs by Rep. Clifford Stearns (R-Fla.), the committee chairman. An earlier hearing looked at trading networks after last year's terrorist attacks, and ECN operators said at that time that the decentralized nature of their networks offered a measure of protection.

No legislation is pending, but with the SEC conducting ongoing reviews of the stock market structure, Stearns made it clear that he likes the consumer benefits delivered by ECNs. The networks, he said, have made "trading cheaper, faster and tailored to fit real market needs."

Supermontage and ECNs

- Nasdaq Stock Market Inc.'s Supermontage, which is a real-time, fully integrated order display and execution system, began processing live trades last week. Analysts say it's "ECN-like."
- House Energy and Commerce Committee Chairman Billy Tauzin (R-La.) said last week that the committee will hold a hearing in the spring on Supermontage and its impact on competition, namely ECNs.

Corrections

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Also last week, our story titled "The Route Less Traveled" mistakenly made a second reference to Doug Ruth, CEO of Onyx Corp., as "Rush."

Terror Response Programs Need New IT Systems Now

All jurisdictions need 'common tactical picture'

BY DAN VERTON

The federal government could create a nationwide homeland security network for information sharing for as little as $1.25 million, according to a former director of the Critical Infrastructure Protection program at the Department of Energy.

Paula Scalingi, a former Energy Department security expert who now heads her own consultancy in Tysons Corner, Va., has proposed to officials in the Office of Homeland Security that they sponsor 10 regional public/private "Partnerships for Homeland Security," similar to what currently exists only in the Pacific Northwest. Each regional partnership could be established with $125,000 in federal funds and $25,000 in seed money from the private-sector owners and operators of critical-infrastructure systems, she said.

"What this would provide is interoperability continentwide," said Scalingi, speaking last week at a conference sponsored by the Council of Security and Strategic Technology Organizations (COSTO) in Washington. "You can't look at the state level, because infrastructures cross states ... and interdependencies don't stop at borders."

The Pacific Northwest already has an evolving public/private partnership: the Pacific Northwest Economic Region (PNWER), which spans five U.S. states and three Canadian provinces. The group plans to hash out its plans at a meeting set for Wednesday in Seattle, where dozens of officials who took part in this year's Blue Cascades interdependency exercise will form eight working groups to prioritize the detailed recommendations that emerged from the exercise [QuickLink 31490].

While most attendees at the COSTO conference reserved comment on PNWER, all agreed that massive changes in IT and management policies are needed at the state and local levels. More than a year after the Sept. 11 terrorist attacks highlighted significant infrastructure vulnerabilities that have the potential to cause massive problems for emergency response teams, terrorism response programs remain woefully inadequate and low tech, said experts.

"While many people think we know how to do this ... we really don't," said John Powers, chairman of Corporate Communications Resources Inc. in Alexandria, Va., and former executive director of the President's Commission on Critical Infrastructure Protection. To this day, one of the major challenges remains finding a way to "bring a semblance of order out of the initial chaos" that results from a major terrorist attack, he said.

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Powers said the nation desperately needs a "network of networks" that can give state and local authorities a "common tactical picture" on their desktops. But budget constraints have conspired with what Powers called "turf and testosterone" to prevent real change from happening.

"What 9/11 presented to the civilian infrastructure was the crossing of the line into chaos," which is the kind of environment in which military leaders are trained to operate, said John McCarthy, head of the critical-infrastructure protection project at George Mason University in Fairfax, Va. The immediate challenge is training local and private-sector leaders to think and act like military commanders.

"That's a skill set that's going to have to be developed in industry," McCarthy said.

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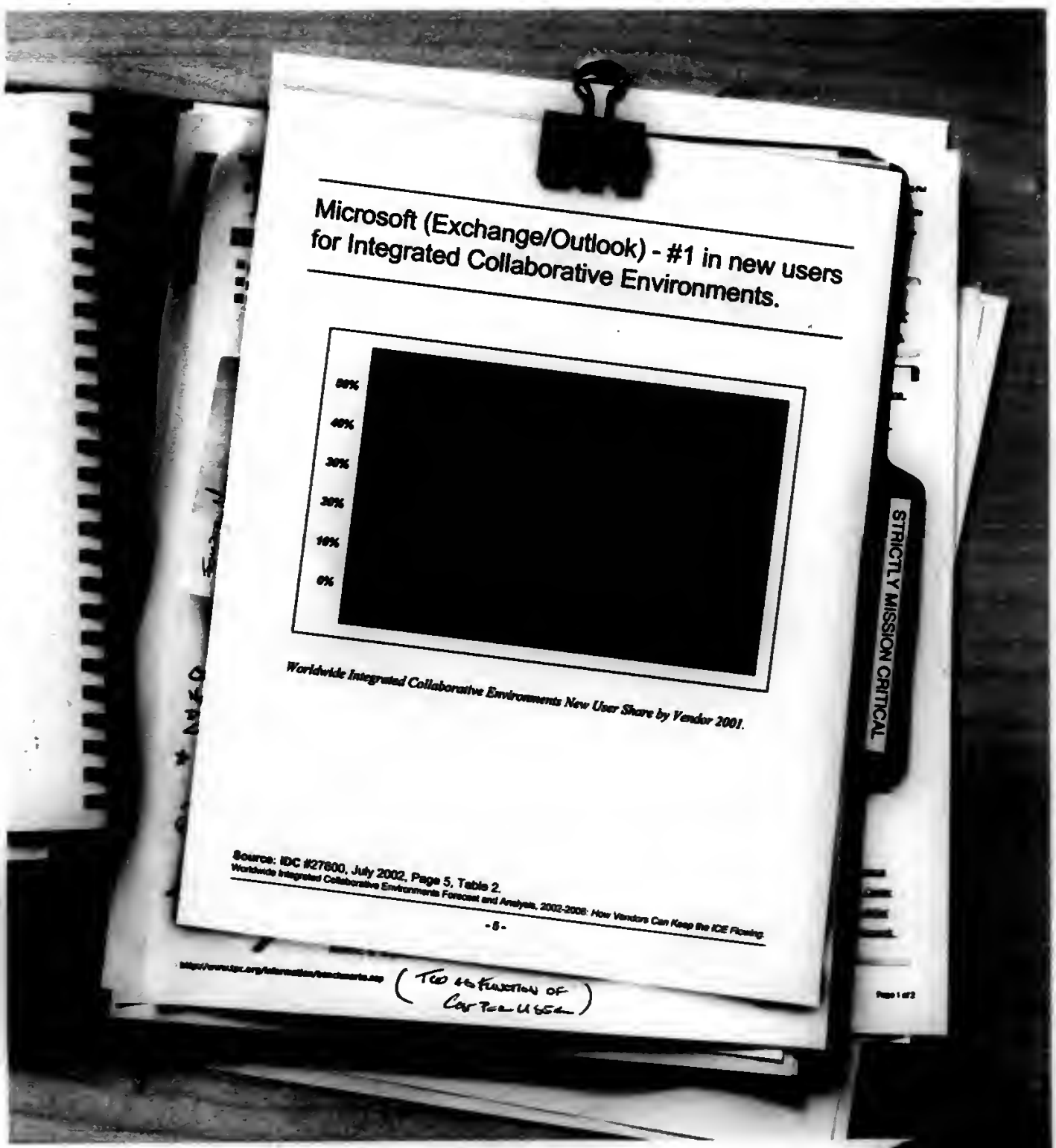
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> JOHN POWERS, CORPORATE COMMUNICATIONS RESOURCES INC

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"What 9/11 presented to the civilian infrastructure was the crossing of the line into chaos," which is the kind of environment in which military leaders are trained to operate, said John McCarthy, head of the critical-infrastructure protection project at George Mason University in Fairfax, Va. The immediate challenge is training local and private-sector leaders to think and act like military commanders.

"That's a skill set that's going to have to be developed in industry," McCarthy said.



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Storage Leaders Rally Around CIM, Preview New Products

Vendors taking big step toward interoperability

BY LUCAS MEARIAN

FOUR DATA STORAGE industry giants have joined together to throw their support behind a proposed interoperability standard and to push new products based on the common set of application programming interfaces (API) contained in the protocol.

IBM, Hitachi Data Systems Corp., Sun Microsystems Inc. and Veritas Software Corp. announced last week that they will begin shipping products this year and next based on the Common Information Model (CIM) and Web-Based Enterprise Management (WBEM) standards.

The CIM/WBEM standards are part of the proposed Bluefin standard, which the Storage Networking Industry Association (SNIA) recently renamed the Storage Management Interface Specifications (SMIS). SMIS is a set of APIs that have the potential to greatly reduce the amount of work it takes to connect hardware and software deployed in multivendor storage-area networks.

IBM, Hitachi and Veritas said they will ship SMIS-compliant hardware and software products next year. Sun announced in August that it had CIM-enabled its StorEdge Enterprise Storage Manager software.

The companies have also formed an alliance to make their CIM/WBEM APIs available to one another for testing, and they want other businesses to commit to conducting interoperability testing and deploying compliant products next year.

Ruth Colombo, senior manager of storage management products at Veritas, said SMIS will allow the company to integrate with other vendor devices for "practically free."

"We can spend less engineering resources integrating with devices . . . and put those resources on developing features that are of a higher value to the customer," she said.

Steve Kenniston, an analyst at Enterprise Storage Group Inc. in Milford, Mass., said the vendor alliance goes a long way toward helping to move the draft standards proposal along by demonstrating industry support.

"The next step will be, if I'm Hitachi, how far down do I drill into my product and allow you to manage it from a CIM-compliant module?" Kenniston said.

According to Kenniston, vendors initially will allow competitors' products to view theirs on a network and interoperate with them. But it will still be two or three years before IBM, EMC Corp. or others supporting the SMIS standard will allow competitors to automatically configure their boxes or give them troubleshooting capabilities — key differentiators today.

But, Kennistnn said, "I believe this is a really good first step and brings CIM compliance to the forefront."

Santa Clara, Calif.-based Hitachi, IBM, Sun and Mountain View, Calif.-based Veritas are active members of SNIA and contributed to drafting the SNIA-adopted Bluefin/SMI specificatinns.

"This is in no way intending to detract from SNIA's efforts to promote Bluefin," said Clodoaldo Barrera, director of storage strategy in IBM's storage systems group. "We're trying to send a clear message that our companies have strong product plans and will be implementing the technology contained in Bluefin sooner rather than later." ▶

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Where CIM/WBEM Is Headed

- **SUN** became the first company with CIM-enabled storage management software when it introduced in August its StorEdge Enterprise Storage Manager.
- **HITACHI** will launch its CIM-enabled HiCommand Management suite of software products by the end of this quarter.
- **IBM** plans to ship new high-end and midrange disk arrays, tape libraries and Tivoli storage management software based on CIM during the first half of next year.
- **VERITAS** said it will CIM-enable its Adaptive Software Architecture, beginning next year with its SANPoint Control and Veritas Volume Manager applications.

StorageTek Launches ATA Disk Array

Eyes fixed-content data market

BY LUCAS MEARIAN

Storage Technology Corp. this week will announce a new class of ATA-based disk arrays for fast disk-to-disk backups and storage of unchanging data with a product line that will offer high-capacity secondary storage at a comparatively low cost. Those qualities are shared with servers introduced by EMC Corp. and others this year, but there are important differences.

The BladeStore B150 server is the first in Louisville, Colo.-based StorageTek's B-Series disk array family. The product line, which will be rolled out during the next year, uses Advanced Technology-Attached (ATA) disks with a Fibre Channel controller to achieve gigabit speeds.

The box can be used as temporary storage before archiving to tape, or as so-called near-line storage for faster access to data online.

Tom Major, vice president and general manager of StorageTek's Disk Business Unit, said that by using ATA, his company was able to drop the price per megabyte of storage from a range of 3 to 10 cents to 1 to 2 cents. Major said prices vary depending on configuration, but a 4TB BladeStore server carries a list price of about $85,000. BladeStore, which will be generally available by the middle of next month, will scale to 160TB behind a single controller.

The starting price yields a system with controller and management software.

"In our midtier systems, there's no reason that your second or third copy of data should cost the same as the first," Major said.

In comparison, EMC's Centera array starts at $101,500 for a 5TB system, plus $103,200 for companion storage management software. While boxes from both EMC and StorageTek target the fixed-data market, which includes X-ray images, checks and documentation, Centera sports a 27-character metadata tag that makes it impossible to copy over or change a file that was previously created.

StorageTek's Foray

The BladeStore server targets:

- **ELECTRONIC** communication data such as IM and e-mail traffic
- **FASTER** backups over tape drives
- **FASTER** disaster recovery via online data
- **FIXED** content such as X-ray images and checks

Bustling Field

Jamie Gruener, a storage networking analyst at The Yankee Group in Boston, said the disk-to-disk backup and fixed-content storage markets are "becoming rather crowded fairly quickly."

"The differentiation will come in how software is used to manage the system and manage the duplication of the data — making sure there's efficient duplication as opposed to multiple copies or blanks sitting on the storage array," Gruener said.

Last week, start-up Avamar Technologies Inc. in Irvine, Calif., launched an ATA-based disk array that's more analogous to EMC's Centera in that it uses metadata to create unique documents that can't be changed. It costs about $175,000 for 7TB of capacity.

In the past, ATA disks have been used only in PCs and lacked the performance and reliability needed at the data center level. But advancements in quality and speeds have more recently made them appealing to vendors seeking a lower price point to hawk to customers.

Still, ATA disks have far slower data transfer speeds than SCSI or Fibre Channel disks, which spin at 15,000 rpm, compared with ATA's 7,200 rpm. For example, StorageTek's high-end D280 Fibre Channel array can perform 160,000 I/Os per second. The BladeStore server can perform just 20,000 I/Os per second. ▶

MORE THIS ISSUE

ATA disk drives could cut storage costs, if only data center managers will allow it. See page 30.

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Business Objects Outlines Revamped Product Road Map

Company to roll out collaborative business intelligence software

BY MARC L. SONGINI
MIAMI BEACH

BUSINESS intelligence software vendor Business Objects Americas Inc. last week unveiled long-term plans to enhance the collaborative nature of its software and to enable users to more easily align it with their business goals.

At the San Jose-based company's international user conference here, executives outlined a new architecture called Sundance that's designed to create reusable, rules-based business intelligence processes. In a keynote speech, CEO Bernard Liautaud explained that Sundance will capture best practices and embed them within the business intelligence applications. Users will access Sundance through a role-based dashboard interface; groups of users will be able to insert messages in the portal screens to facilitate collaboration.

Sundance is also designed to measure performance goals, such as sales or marketing targets, and generate reports and alerts to help users monitor their status. If an unexpected event, such as a major drop in sales, interferes with reaching the goal, an alert is triggered. The system then gives the appropriate persoo multiple recommendations of what to do.



"You get to a situation and there will be three to five next steps [offered] to handle the problem," said Dave Kellogg, senior group vice president of worldwide marketing at Business Objects. The Sundance architecture isn't ready for commercial deployment; Kellogg said more details will be announced before the end of the fourth quarter.

User Reaction

Some users at the show expressed cautious interest in Sundance. Etoi Moore, an IT consultant at the Florida Lottery in Tallahassee, said she's interested in beta-testing Sundance because of the way it builds in workflow for process control and improvement, which would lessen the need for customization. The Florida Lottery has deployed Business Objects WebIntelligence thin-client analytical software to 40 users.

David Rewerts, IT system analyst at Principal Financial Group, said the concept is interesting, but it might be best suited to small and midsize businesses. In large corporations, the groups trying to collaborate might prove to be too large, and the process could become cumbersome, he said. Principal, a financial services company in Des Moines, Iowa, uses WebIntelligence 2.6.3.

Business Objects also provided some details on the next generation of its thin-client WebIntelligence product, dubbed Tosca. Among the new features will be beefed-up reporting and analysis capabilities and a portal that users can more easily customize, company officials said.

The product will go into beta testing this week and will be generally available by the middle of next year. ▶

Keynote to Offer Web Site QA Service

Users will be able to test sites before deployment

BY MATT HAMBLEN

Keynote Systems Inc. will roll out a service next week to help corporations perform Web site quality testing and comply with government regulations.

The service, called Enterprise HTML Toolbox, is designed to help customers build Web sites free of HTML glitches and spelling errors. It can also test for desktop browser compatibility and ensure that download times are reasonable, according to the San Mateo, Calif.-based company.

One potential customer of the service said Web surfers are less likely than ever to tolerate shoddy sites. "Users don't put up with much anymore, whether it is slowness or sloppiness or errors, and if they encounter such things they are not willing to risk their money," said Rod Ketchum, systems architect at Recreational Equipment Inc. (REI) in Seattle.

REI, which sells outdoor gear, runs a business-to-consumer Web site that receives 1.5 million hits per day.

Ketcham said he already uses products from Keynote to judge the ease of buying from REI's Web site and to monitor connection times for users in various locations.

With Enterprise HTML Toolbox, organizations could monitor and manage content from multiple sources, including business-to-business partners, checking for things such as bad links, inconsistency in logos and names, or even inappropriate material, analysts said.

> **"Users don't put up with much anymore."**
>
> ROD KETCHUM, SYSTEMS ARCHITECT, REI

Features include the ability to monitor for HTML coding errors, which can be automatically repaired by Keynote's software, said analyst John McConnell at McConnell Associates in Boulder, Colo.

Some features allow sites to be monitored for the HTML tags needed to make pages conform to federal regulations regarding people with visual disabilities, said analyst Bill Gassman at Gartner Inc. in Stamford, Conn.

"One of the big drivers of this technology will be Section 508 requirements of the Americans With Disabilities Act," Gassman said. He said the service can be configured to allow users to check whether an image includes a tag to provide an audible sound for visually impaired people. Keynote will enhance the service early next year to include more Section 508 requirements, said product manager Leslie Gaillard.

Enterprise HTML Toolbox will require installation of a hardware appliance running Keynote's software within an enterprise firewall, Gaillard said. It will cost $2,500 per month per device for an unlimited number of tests.

The service is based on technology developed by NetMechanic Inc. in Waco, Texas, in 1998 and sold originally on an application service provider basis to small businesses.

Keynote bought NetMechanic in May 2002 and added greater scalability for monitoring thousands of pages. The company also improved security by adding the internal hardware appliance, said Jeff Morgan, a Keynote product development director, formerly of NetMechanic.

McConnell said pieces of the Keynote service are already provided by competitors, but not the complete package.

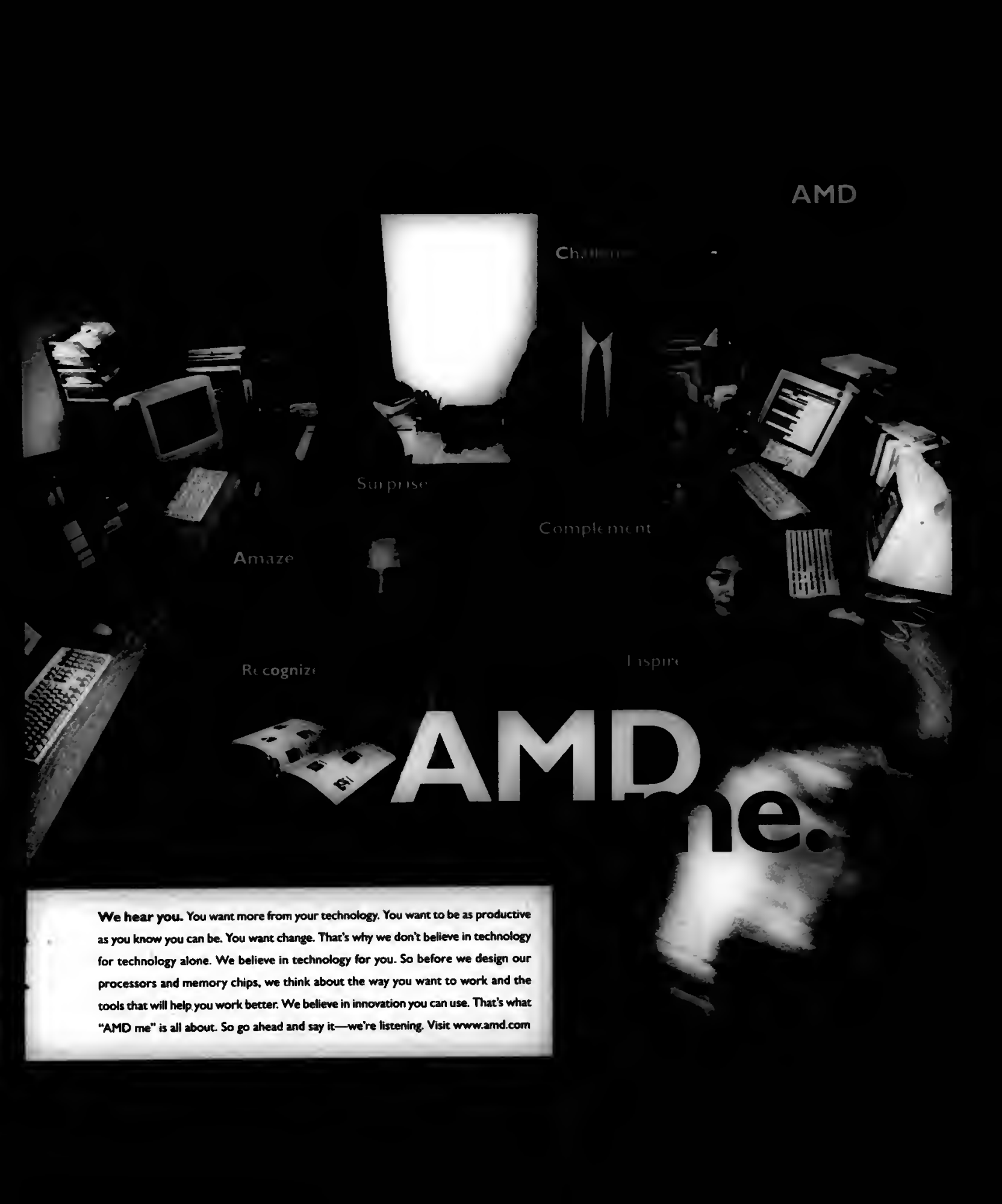
And Gassman said that while the service finds and even fixes many problems, Web developers will still have a great deal of quality assurance work to perform. "Plenty of Web sites could use improvement," he said. ▶

New From Keynote

SERVICE ANNOUNCED
Enterprise HTML Toolbox, software and hardware installed inside a firewall to conduct Web testing prior to deployment.

FEATURES
Checks links, HTML, browser compatibility and image optimization. Can automatically repair HTML errors.

PRICING
$2,500 per month per device for unlimited tests.



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Continued from page 1

Linux

to use Linux' is larger than we can handle," said Rick Carey, chief technology architect at Merrill Lynch & Co. in New York. "I'd say it will be significant over the next year. A majority of new projects are interested in Linux."

While Cary said he still prefers Microsoft's performance for some functions, such as desktop applications, he said the cost of running Linux is typically a tenth of the cost of Unix and Microsoft alternatives.

Since the beginning of the year, Carey has beeo immersed in a Linux rollout for mission-critical applications, including a mainframe-based 401(k) application that generates about 200,000 statements every quarter.

Merrill Lynch also runs Linux oo 50 dual-processor Intel boxes that are clustered together to perform complex analytics related to foreign exchange options. Most of Carey's work has beeo on creating Linux prototypes and ensuring compatibility with other systems.

Merrill Lynch is in good company, with other New York-based firms such as Morgan Stanley Group Inc., The Goldman Sachs Group Inc., Credit Suisse First Boston Corp., and ETrade Group Inc. in Menlo Park, Calif., all deploying Linux systems.

According to a report released earlier this month by market research firm TowerGroup, some of the brokerages are deploying trading applications on Linux, "while second-tier brokers have not progressed beyond using it to deploy file/print servers as they wait for [independent software vendors] to begin supporting [Linux]."

Recent concerns in the areas of security, disaster recovery and business continuity are also pushing brokerage houses to fall back on the reliability and robustness of their old mainframes, which can run Linux more cheaply than Unix, according to Dushyant Shahrawat, a senior analyst at TowerGroup and author of its latest report oo Wall Street and Linux.

Shahrawat said Linux is making headway in brokerages because the money-flush firms have always been among the earliest adopters of technology. Also, as an open system, Linux works well across the variety of systems normally found in sprawling financial services operations.

"They've got NT boxes, Java running oo Unix, lots of mainframes, and they're tired of having to support applications oo them. Now out comes a platform that runs on all of them. That's a very compelling value proposition," Shahrawat said.

ETrade made a fundamental change in its operating system strategy by deploying 90 IBM xSeries 330 servers running Linux last January. The open-source, standards-based platform held the promise of cost savings, according to Josh Levine, ETrade's chief administrative officer.

Using Intel-based servers and Linux has saved the online discount brokerage "millions of dollars" in software costs, said Levine.

TowerGroup estimates Linux is currently deployed on 7% of all servers in North American brokerage firms. Linux use will grow at an annual rate of 22% in the securities server market between 2002 and 2005, outpacing growth in Windows 2000, NT and Unix deployments, TowerGroup said.

EMC Sales Drop; Layoffs Continue

Low IT spending cited for $51M decline

BY LUCAS MEARIAN

STORAGE GIANT EMC Corp. reported last week that its third-quarter sales dropped by $51 million compared with the second quarter, a slide it predicted earlier this month and attributed to a reluctance by IT managers to spend on new projects.

EMC President and CEO Joe Tucci said in a statement that sales were down because customers are "underspending their existing budgets, striving to balance expenses in order to offset their own revenue shortfalls."

Sales for EMC during the quarter, which ended Sept. 30, totaled $1.26 billion, a 4% increase over last year's third quarter, but a drop of 9% percent from the second quarter of 2002. The company reported net income of $21 million this quarter.

"As a result, we are taking further steps to align our costs with the realities of this painful economy," Tucci said.

Bill Teuber, EMC's chief financial officer, said the company would "extend" its cost reductions, which include laying off 1,350 employees, or 7% of its worldwide workforce, dropping its total number of workers to 17,000. EMC announced the latest round of layoffs Oct. 3 [QuickLink 33431].

"We expect the majority of this reduction will be completed during the fourth quarter of 2002," Teuber said.

EMC has been focusing its attention on the midrange marketplace. In the past few months, it launched two arrays that will be sold by partner Dell Computer Corp.

Salomon Smith Barney research analyst Clinton Vaughan said in a research note that EMC has gained share in the midrange market this quarter while losing ground on its high-end Symmetrix arrays "due to tempered demand in front of its upcoming Symmetrix 6 product launch."

Overall, Hopkinton, Mass.-based EMC lost about 1.7% in market share quarter over quarter, while IBM and Hitachi Ltd. each gained about 1%, Vaughan said.

"Both IBM and Hitachi recently launched new high-end storage products which gave them a boost in [the third quarter] after eroding/stalling their shares in [the first half of 2001]," Vaughan said.

MORE HEAVYWEIGHTS

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SuSE Linux Unveils Business Groupware Server Product

Enterprise collaboration capabilities have come to SuSE Linux AG, as the company today unveiled SuSE Linux Openexchange Server, which includes a full range of communications and groupware features.

In an announcement last week, the Germany-based company said the product will include the SuSE Linux Enterprise Server operating system as well as an established e-mail server and extensive groupware functions.

The product includes integrated Web mail clients, a central appointment and address management system, and project management and task planning tools. Also included are a centrally controlled document management tool and group-based discussion forums for project teams.

SuSE Linux Openexchange Server, which will be available by the middle of next month, will work with all common browsers, according to the company. Users will be able to access the communications services from anywhere in the world using a computer with any common operating system and an Internet connection.

Data synchronization features for Palm and Pocket PC devices are also included. Users of Microsoft Outlook will also be able to synchronize and edit appointments, tasks and addresses using Openexchange Server.

Pricing for the product begins at $1,249, which includes a license for 10 groupware clients and an unlimited number of e-mail clients. The company said its server is priced 59% to 64% lower than a comparable Microsoft Exchange system. Customers using SuSE Linux eMail Server 3.x and the SuSE Maintenance Service can upgrade to the new product under their maintenance agreements.

NEW PRODUCT

Openexchange Server

- Appointment, address book functions
- Project management features
- Integrated Web mail clients
- Group discussion forums

Dan Kusnetzky, an analyst at IDC in Framingham, Mass., said the new product could help Linux become established in the business collaboration marketplace. According to IDC figures, collaboration, including e-mail and messaging, is the No. 2 use in Microsoft Windows business workloads; file and print serving is No. 1.

The new server product's ability to replace Microsoft Exchange as the collaboration server in the enterprise "would be persuasive for at least some people to try it," Kusnetzky said.

The new server application provides most of the features in Exchange and would allow the Outlook client software to work with the SuSE product and think it was talking with Exchange, he said. "The idea is it would allow Linux to be introduced into a Windows environment and an Exchange environment with little disruption," he said. "Taken together, that would allow SuSE to attack" the market and give the company a more complete product lineup, he said.

– *Todd R. Weiss*

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Microsoft

Former Lotus CEO Speaks Candidly About Job Shift

Papows discloses plan for start-up

BY DON TENNANT

IN JANUARY 2000, when **Jeff Papows** announced that he was resigning from his high-profile position as CEO of IBM subsidiary Lotus Development Corp., he was one of the most-watched CEOs in the IT industry. Now he works out of a nondescript business center in Burlington, Mass., as president and CEO of Maptuit Corp., a start-up that makes route optimization software for the trucking industry.

In a candid interview with *Computerworld* last week, Papows discussed his reasons for the switch and talked about his calculated strategy for ensuring that Maptuit reaches its destination.

What has the culture shock of the change been like? Day to day, in terms of the way your time gets spent, it's very different. I probably spent 30% of my time at Lotus communicating with the organization. When you're motivating an organization of 10,000 people, you spend an enormous amount of time ensuring that what you casually said to somebody in the men's room doesn't become an organizational manifesto for 300 people down the hall because you happened to sort of make conversation.

What do you miss the most? I miss competing with Microsoft or one central, competitive figure that you can get out of bed every morning [to challenge]. I loved competing with Microsoft. You know, the greatest goddamn thing that ever happened to Lotus Notes was Microsoft Exchange. Because the rate of innovation and the competitive zeal that [Lotus had] would have never beeo there in anywhere near the same texture if it hadn't been for Microsoft.

So why did you leave? I basically worked myself out of a job. I mean, at that point Lotus had 60% of the market share. And you know what it's like to install Notes or Exchange — once it's in, it ain't coming out; the switching costs are way too high. So the war was over, and Lotus had squeaked out a narrow victory. And it was a cash cow. At that point they needed a general manager; they dido't need a CEO.

What on earth attracted you to Maptuit? I took a look at it really only because it was a recurring, subscription-based pricing [model]. Having spent way too many Maalox moments at Lotus — and other places like Cullinet [Software Inc., where he held a series of senior executive positions,] and Cognos [Inc., where he was president and chief operating officer] — trying to do the last couple hundred million dollars of revenue in the last couple days of the quarter, shooting elephants, I was really interested in that.



Maptuit was founded in 1999 as a consumer-facing mapping service. You came in a year later and turned everything upside-down. Why? With a little bit of help from IBM, I did some primary market research and concluded that you could take the same base technology, which was this incredibly rich, geospatial model of the road network in North America, and easily point it in a different direction.

There's a bunch of publicly available data for the road network, and any idiot can license it. But what Maptuit had was four or five rocket scientists — literally out of the aerospace industry — that really understood the technical algorithms to aggregate all that public and private data into optimal routes.

That's much more of a Jeff-Papows-like business-to-business model; and it just took me a while to twist the company and the technology into a place where my experience was useful. Theo I went to Qualcomm Inc., and got them to really investigate the technology; and about two months ago they began reselling the product directly — which for an early-stage company is a huge win.

Earlier this month you got $6 million in third-round venture funding, which is pretty difficult to do in the current business climate. How did you manage that? I think that was a byproduct of having taken an uncharacteristically mature, fanatically detailed look at picking a market segment that was unfragmented, underserved, where the ROI of the technology was brain-dead obvious.

Are you going to defy the odds and go for an IPO? I think it's less likely that the company will ever go public than it is that the company will be acquired. When I was looking at market segments, I deliberately picked a segment where I thought there would be as many prospective acquisitive partners as not.

So let's say Qualcomm or whoever decides that Maptuit is an asset that they really want to control, and we become an acquisition candidate for a Qualcomm or whatever — pick your fanciful representation. That's a scenario where I've got more experience than anybody oo the planet, making those things work. ◗

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FTC Told of State Barriers to E-Commerce

Rules costing consumers billions

BY PATRICK THIBODEAU
WASHINGTON

State regulations are preventing e-commerce from reaching its potential and costing consumers billions of dollars, the U.S. Federal Trade Commission was told earlier this month at a workshop on the impact of state rules on Internet businesses.



There appeared to be little disagreement among e-commerce experts on the harmful impact of state rules that, for instance, can stymie Internet-based real estate brokers from offering services at lower commissions and automakers from offering discounted vehicles.

Robert Gertner, an economics and strategy professor at the University of Chicago, said that if e-commerce-based transactions could reduce the typical 6% real estate commission by 1% and lower the cost of a car by 2%, consumer savings would exceed $10 billion annually.

Restrictions on Internet sales "have limited the ability of e-commerce companies to provide consumers with the full potential of the Internet," said Gertner. "The justifications for these restrictions are typically weak."

The FTC, which is responsible for ensuring that competition isn't impeded, hasn't decided whether state restrictions are justified.

"The FTC is very much in a learning mode," said commission Chairman Timothy Muris. "We do oot know whether particular restrictions are or are not, oo balance, pro-competitive or pro-consumer. Nor have we decided what, if anything, should be done about any possible restrictions that may harm consumers."

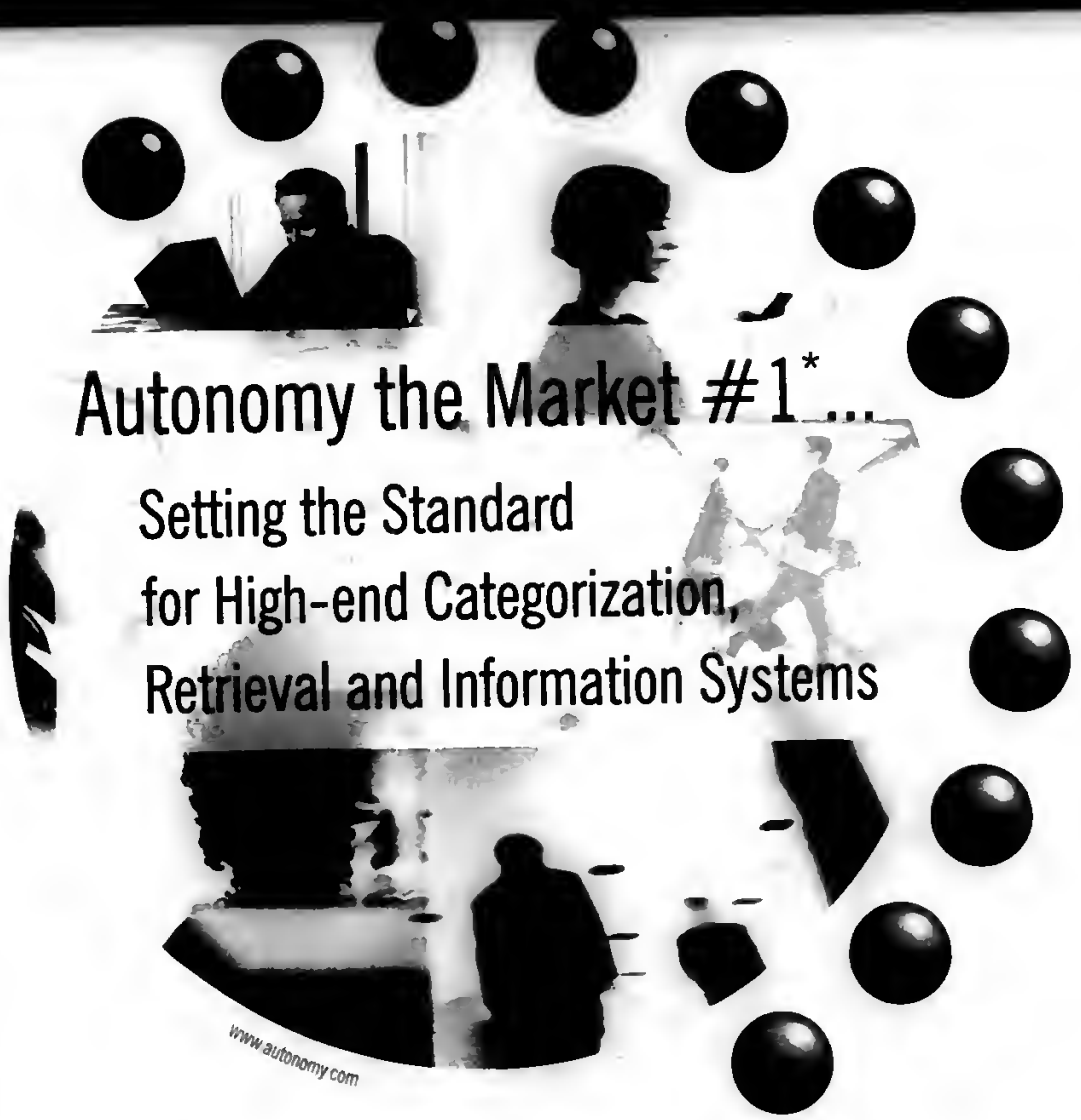
But Rep. Cliff Stearns (R-Fla.), chairman of the House Subcommittee oo Commerce, Trade and Consumer Protection, argued that state laws are being used to protect industries from Internet-based competition.

"There are many industries where state law and regulation are either unintentionally or intentionally impeding the growth of e-commerce," Stearns said.

State rules, as well as industry practices, that make it difficult for e-commerce firms vary widely. For instance, some states require financial services and real estate companies to maintain offices within the state in order to conduct business there. Some states are considering laws that would extend their auctions rules to online sellers and franchise laws that would limit direct sales by automakers.

But opponents of these state rules said the commerce clause of the U.S. Constitution prohibits these restrictions.

"I think we have to take seriously the notion of federal preemption," said Robert Atkinson, vice president of the Progressive Policy Institute., a liberal think tank in Washington. "Ensuring that we have robust, cross-border commerce is a role for the federal government to step into." ◗



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More fundamentally, the tremendous success of Dell's direct business model can't be separated from the peculiarities of the PC business itself. It's the near monopoly positions of Intel and Microsoft that have forced PC makers to compete almost solely on efficient assembly and distribution. In contrast, the key suppliers of printing, storage, networking and other technologies almost always sell their own branded end-user products, and therefore their willingness to work with Dell is inherently much more problematic.

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Maryfran Johnson is editor in chief of Computerworld. You can contact her at maryfran_johnson@computerworld.com.

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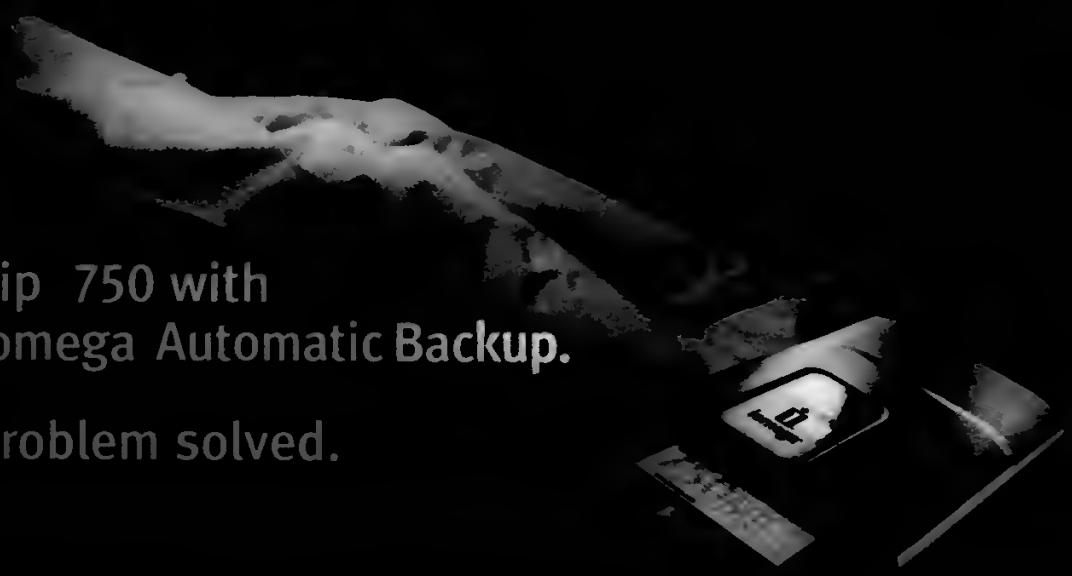
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Five Cost-Cutting Strategies
Stova Wong (left), director of networks and telecommunications at Paul, Hastings, Janofsky & Walker LLP, saved money by consolidating 18TB of data on SANs. Page 26

Cloning Data for Disaster Recovery
Many storage upgrades are being propelled by the need to replicate data over long distances for disaster recovery purposes. Sometimes, data is replicated to sites that are 10, 20 or even hundreds of miles from headquarters. Page 36

EDITOR'S NOTE

SURE, WE COULD TALK ABOUT storage virtualization, but I'm not sure it really exists. So let's talk about something real:

- Storage demands are doubling every year.
- IT budgets aren't.
- Data is valuable.
- Valuable data could be stolen or lost.

That's why this special report covers "cheap and secure" data storage. OK, there really is no such thing as cheap storage, but there are ways to cut costs. Unfortunately, you have to spend money — on storage networking — to save money in the long haul. But you can make a business case for this spending by demonstrating just how costly data downtime is.

Think of a customer relationship management system. It's just a white elephant if the call center representatives can't get the historical data they need to upsell, cross-sell or mollify the customer.

And that customer data has to be secure. (Just ask your legal office or chief privacy officer, if you have any doubts.) As companies slowly move to IP storage, the industry must figure out how to protect IP storage from hackers (internal and external) without degrading performance too much.

Keeping hackers out is one way to protect data, but the events of Sept. 11, 2001, vividly demonstrated how data could be obliterated in an instant. The term *disaster recovery* is now driving many storage projects, as companies replicate data at two locations in case one goes down.

That's why data storage is moving from an unglamorous back-office function to the top tier of the CIO agenda.

Mitch Betts (mitch_betts@computerworld.com) is director of Computerworld*'s Knowledge Centers.*

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Cheap & Secure Data Stores

Practical advice on cutting costs, securing the SAN and replicating data for disaster recovery.

The Story So Far

Magnetic drums weren't good enough for a supply depot in Ohio. So IBM invented the hard drive. By Frank Hayes

THE DISK DRIVE wasn't a new idea 50 years ago. It just wasn't seen as necessary. Punch cards and magnetic tape could store unlimited data, though access to any particular item was slow. Magnetic drum devices, which stored bits of information on the surface of a rotating metal drum, could store between 2KB and 8KB of data and allowed quick random access. Who would ask for more?

The U.S. Air Force, that's who. In 1953, an Air Force supply depot in Ohio wanted instant access to 50,000 inventory records — far more than drums could hold, and far faster than tape could deliver. A team of IBM engineers in San Jose spent the next year designing a 5MB device with a stack of 50 2-ft.-wide disks spinning at 3,600 rpm, using compressed air to keep the single read/write head from crashing onto a disk surface.

First Words on Disk

On Feb. 10, 1954, the engineers wrote and read back the first words stored successfully on a hard drive: "This has been a day of solid achievement." And the mainstay of modern mass storage was born.

IBM's RAMAC 305 gave the company an early lead in what Big Blue called DASD, or direct-access storage devices. But by 1962, other vendors were making mainframe disk-drive systems, and drive sizes had climbed to 28MB. The drives made online transaction processing practical, since businesses could now access large amounts of inventory and customer data in real time instead of using batch processing.

But as the volume of online data grew, managing storage became a major issue. Drive capacity was still limited, so punch cards and half-inch tape were still widely used for batch processing, and tape was also used for backing up online transaction data. By the early 1970s, disk-to-tape backup and restore utilities were a standard part of mainframe operating systems.

In 1973, IBM's San Jose labs made another breakthrough: The Model 3340 Winchester disk, a hermetically sealed hard drive with lightweight heads that rode only 18 microinches above the disk surface, compared with 800 microinches for the RAMAC. The resulting higher capacity, faster performance and lower cost made Winchester technology the new standard.

One company that adopted Winchester technology was Shugart Associates, founded by onetime IBM hard-disk product manager Alan F. Shugart (who later founded hard-disk giant Seagate Technology). By 1979, Shugart Associates was attaching its hard drives to desktop computers using a device-independent parallel connection called SASI, for Shugart Associates Standard Interface. In 1982, SASI was renamed SCSI (Small Computer System Interface) and eventually became a standard for connecting storage devices to computers of all sizes.

Through the 1980s, system vendors continued to improve utilities for migrating inactive online data to tape, consolidate unused storage space and compact archived data. In 1988, researchers led by David A. Patterson at the University of California, Berkeley, published their description of redundant arrays of inexpensive disks, or RAID. Arrays of disk drives had been used before to replace large, expensive disks, but Patterson's team developed a complete architecture that would eventually become an industry standard.

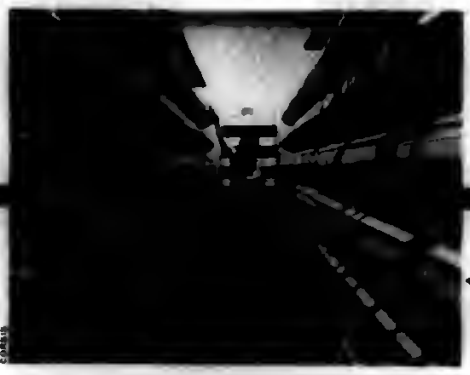
Jumping to Jukeboxes

RAID wasn't the only change in the traditional disk-and-tape world of storage. By the late 1980s, write-once optical disks such as CD-ROMs had arrived; they were slower but more durable than tape and easier to access using automated jukebox systems.

In the 1990s, storage demands skyrocketed due to data warehouses, online analytical processing, multimedia and Internet applications. At the same time, while the speed of traditional directly attached storage connections such as SCSI and Fibre Channel had grown to 100MB/sec., network transfer rates for Gigabit Ethernet were even faster. In 1995, storage vendor EMC Corp. developed the concept of network-attached storage, in which storage devices could be accessed by any computer on a high-speed network.

Today, storage-area networks can include RAID arrays that back themselves up to tape automatically, automated jukeboxes of fast optical disks and tape cartridge servers, all connected by fast networks and controlled by storage management software.

And now, on with the story . . . ▶



1956: IBM officially announces the RAMAC 305, the first hard-disk system, which holds 5MB of data.

1973: IBM's hermetically sealed Winchester hard disks become the standard design for disk drives.

◀ **1986: Computer tapes at an IRS service center in Ogden, Utah.**

1988: SCSI is officially standardized by the American National Standards Institute.

1995: EMC Corp. develops the concept of network-attached storage.

1998: Gigabit Ethernet becomes formal IEEE standard.

1950 | 1960 | 1970 | 1980 | 1990 | 2000

1961: Ampex Corp. develops helical scanning video recording, which will later be adapted for high-capacity tape backup.

1962: IBM Advanced Disk File uses one head for each disk surface, eliminating the need for compressed air to position heads.

1979: Alan F. Shugart and Finis Conner launch Seagate Technology to produce hard disk drives for desktop computers. ▶



1979: Philips demonstrates optical storage drive technology as part of a joint venture with Control Data Corp. Commercial products appear five years later.

1988: David A. Patterson leads a team that defines RAID standards for improved performance, reliability and scalability. ▶



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Cost-Cutting Strategies

There are no cheap shortcuts. You have to spend money on storage networking to save money down the road. By Barbara DePompa Reimers

MANY ORGANIZATIONS are struggling with escalating demands for storage and better disaster recovery — while plodding through a tough economic climate with frozen budgets and overworked staffs.

These organizations realize that saving money on storage is nearly impossible without costly investments in networked storage technologies. Unfortunately, storage networking isn't cheap and doesn't offer a quick fix to immediately reduce storage costs.

So the paradox of storage is that you have to spend money to save money. What's an organization to do?

Industry analysts, consultants, storage suppliers and IT organizations say that reducing storage costs is a step-by-step process that begins with diligent and ongoing planning. Here are the five key steps:

1 Plan to Consolidate

The first step is to apply "data center discipline" to storage outside the data center. It's critical to consolidate storage across all platforms to reduce managemeot and maintenance costs.

Having, say, seven servers with direct-attached storage is far less efficient than having a storage-area network (SAN) that acts as a pool of storage for various servers to use. For one thing, a single pool of storage is cheaper to manage than separate, direct-attached storage systems. Also, when storage is shared across a SAN, there's no need to maintain large amounts of excess capacity (for mirroring or back-up purposes) for each server.

For example, Ahold USA, part of the Royal Ahold Group in Zandam, Netherlands, migrated from direct-attached storage to an IBM SAN infrastructure that has reduced management costs from $1,300 per gigabyte to

Continued on page 28


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Royal Ahold is a rapidly growing international food provider with supermarket operations in the U.S., Europe, Latin America and Asia. It has more than 7,000 supermarkets and specialty stores and annual sales approaching $50 billion. The result is a deluge of data. Ahold's combination of inventory records, daily sales figures, customer buying patterns, sales trends, employee data and financial reports have pushed its data volume up by 30TB in the past 36 months, to 62TB of storage.

With that kind of mushrooming storage demand, Chris Collins, manager of enterprise architecture, realized Ahold needed to investigate networked storage to reduce not only administrative costs, but also the company's dependence on mirrored storage. One data warehouse, for example, took 4TB plus an additional 4TB of mirrored storage in the direct-access storage environment. "We made a hard choice moving to IBM's Shark, to go with RAID V architecture. The database administrators fought this change," she says.

But now, instead of needing 8TB for a 4TB data warehouse, the entire system uses just over 4TB — a huge capacity savings over the previous storage environment.

During the past three years, Ahold has also consolidated its hardware environment to Windows 2000 on Intel-based servers, AIX and S/390, and has decided to stick with one supplier for disk storage — all to reduce costs and management headaches.

Ahold's latest move from the IBM F Model Shark series to the new Model 800 Sharks has doubled capacity from 3.5TB to 6TB and tripled the number of disks per SAN subsystem. Collins says that means savings of $1,100 per gigabyte over the former direct-access storage model.

Next up: Planning for storage virtualization. "It's an incredible concept, offering great price/performance potential, but it's still scary," Collins says.

So Ahold will start testing virtualized storage subsystems sometime next year and then roll them out slowly during the next two years.

2 Connect Modular Subsystems

One advantage of storage networking is that you can plug in storage capacity in a modular fashion whenever the business demands it — and help avoid downtime due to occasional storage shortages.

Moving to networked storage environments that incorporate modularity makes it far easier to maintain and allocate storage as required by business needs, and will definitely reduce costs, according to Jim Porter, president of Disk/Trend Inc. in Mountain View, Calif. While "going modular" primarily reduces the cost of downtime, it also reduces regular daily operational costs — it takes far more resources to maintain several direct-access storage devices than it does to maintain a SAN.

Los Angeles-based Paul, Hastings, Janofsky & Walker LLP, a global law firm, was running into a storage crisis every few months with its direct-attached storage. Now it's implementing an 18TB storage infrastructure from Hopkinton, Mass.-based EMC Corp. to meet the demands of critical applications, including monthly billing, documentation, accounting, e-mail and other enterprisewide software.

The law firm needed to save money and more efficiently manage storage resources because the cost of direct-attached storage for more than 100 file servers was becoming untenable. "Maintenance and miscellaneous costs for the Los Angeles office alone exceeded $400,000 annually," says Stova Wong, director of networks and telecommunications.

Wong evaluated offerings from IBM, Hewlett-Packard Co. and EMC. He chose EMC because of its experience with the legal profession in Los Angeles. This past spring, the firm began installing EMC Symmetrix and Clariion SANs using Fibre Channel switches to provide consolidated storage.

The law firm is also implemeoting networked-attached storage (NAS) for image-based documents and other visual materials that support litigation. And EMC management software will centrally manage the entire SAN and NAS infrastructure.

The networked storage environment is still being rolled out, but it has already improved the accuracy and efficiency of billing processes, reducing the time to complete month-end processing from six hours to one. "That translates to lower accounting costs because we no longer must pay the accountant to wait for six hours while billing reports are processed," says Wong.

Most of the savings have come from reducing administrative overhead and production downtime, he says. Previously, the law firm experienced storage shortages every few months, which meant systems had to be taken down. That situation has beeo eliminated in the networked storage infrastructure.

3 Manage Storage Ruthlessly

"Hold users accountable" for the storage they use, says Chuck Hollis, vice president of markets and products at EMC. "You must know how much storage capacity you have — enterprisewide —and what it's being used for."

Amazingly, many organizations don't have a handle on their storage utilization levels — except in mainframe environments, where very little capacity is wasted. But industry estimates suggest that 30% of storage capacity in Unix environments is wasted. And that figure goes as high as 70% in Windows environments.

Hollis often tells customers "you are still wasting up to two-thirds of your current storage capacity and can improve utilization and cut costs by an average of one-third by consolidating on networked storage and managing storage ruthlessly."

This really means keeping tabs on what's being stored. "When storage is presented as free and infinite, everyone will use all of it op," Hollis says. But IT organizations must be able to scrutinize "the business benefits of those 2TB of MP3 files on a Windows server," he says, if they want to control utilization costs.

4 Search for Interoperability

Modularity gives IT organizations a giant step forward in reducing storage management costs, but interoperability is considered the Holy Grail, enabling customers to pick and choose from multiple network storage devices to keep costs down. "For the most part, however, this is still largely a pipe dream," says Disk/Trend's Porter.

Storage suppliers are moving very slowly toward making their networked storage devices open and interoperable. And working with interoperable storage takes special fortitude for managing multiple storage vendors.

5 Bring on New Technology

If reducing storage costs is a step-by-step process, adding new technology is really the final step. There are plenty of new technologies — virtualization, iSCSI, storage on demand — with proponents claiming each one will reduce long-term storage costs, says Dan Tanner, an analyst at IDC in Framingham, Mass.

But the key is to do your homework: Proper planning, standardizatioo and consolidation are critical. Migrating to modular, interoperable storage devices is a next logical step. And cootrolling storage growth by ensuring that users understand that storage isn't a free, infinite resource, is also important.

Ultimately, IT professionals say they understand there's no quick or easy solution. Ed Moore, IT director at CDNow Inc., a New York-based Internet retailer of CDs, videos and DVDs, says he has yet to actually reduce storage costs via recent investments in EMC SAN technology. But he says it's best to focus on cost avoidance. "That means incorporating new technology to avoid spending additional amounts managing outdated storage subsystems in the future," he explains.

DePompa is o writer and editor in Germantown, Md. Contact her at bdepompa@aol.com.

Making the Business Case

How, in this tough economic climate, do you get top management to spend money on storage technology in order to save money down the road?

Stova Wong, director of networks and telecommunications at Paul, Hastings, Janofsky & Walker, seems to have found the magic words to talk his senior management into a SAN. Wong says he focused on the business value of modular, networked storage, and the phenomenal cost of downtime and business lost due to systems being unavailable during important court cases.

"You will never convince anyone that migrating to networked storage is a good idea based strictly on the cost. It's undoubtedly expensive," Wong says.

"But talk about what it costs to take down our systems when attorneys are closing in on the final moments of a major case. Or discuss the revenue and interest lost when the firm can't send out a billing on time," he says. "It's critical to make management understand the business impact of these kinds of situations to approve any storage investments, especially in the current economy."

– Barbara DePompa Reimers

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Cheap Tricks

Inexpensive ATA disk drives could dramatically cut storage costs, but only if data center managers let them in. By Lucas Mearian

A LOW-COST DISK DRIVE technology better known in the PC world is on the verge of showing up in the nation's corporate data centers — if only the technology can shake that PC image.

Advanced Technology Attachment (ATA) is an interface that connects a computer's system bus to disk storage devices. Drives built to the standard, which is also known as Integrated Drive Electronics (IDE), have mainly been used in PCs to date.

But advances in the quality of disks in general — and the long-awaited release of products using a new ATA standard — have prompted vendors such as Hopkinton, Mass.-based EMC Corp., Sunnyvale, Calif.-based Network Appliance Inc. and Blue Bell, Pa.-based Unisys Corp. to put ATA disk drives into corporate data storage devices.

Cost Advantages

"If you're looking at a box that can be sold profitably for 1.5 to 2 cents a megabyte as opposed to SCSI at 3 to 5 cents and Fibre Channel for 7 to 15 cents [per megabyte] for the enterprise, yeah, there are some real price advantages to ATA," says Bob Zimmerman, an analyst at Giga Information Group Inc. in Cambridge, Mass.

Scott Studham, group leader of the molecular science computing facility at the U.S. Department of Energy's Pacific Northwest National Laboratories in Seattle, recently replaced a 20TB tape archiving system with servers that use parallel ATA drives. "It's disk speed at tape cost," he says. "I'm totally in love with this."

Today's parallel ATA drives have a data throughput of 100MB/sec., but a new serial ATA standard will boost that to 150MB/sec. and eventually to 600MB/sec. Serial ATA products are expected to begin shipping in bulk in the second half of next year.

But ATA faces an image problem that must be solved before it will be accepted in mainstream data centers. "You get users saying, 'I don't want that PC desktop disk in my storage environment,' but they have to overcome that perception," says Roger Cox, an analyst in Gartner Inc.'s San Jose office.

ATA disk technology is considered less reliable than SCSI-attached drives because ATA disk drives are tested in batches instead of individually and the mean time between failure is substantially less. But experts are quick to point out that the mean time between failure of today's ATA technology is about 10 to 20 times longer than SCSI-attached disk achieved in the 1990s.

Another issue is that ATA disks are slower than SCSI disks, spinning at 5,400 to 7,200 rpm vs. 15,000 rpm for SCSI.

Even so, with ATA disks at one-third to one-fourth the cost of SCSI-attached disks, analysts say IT managers should be pushing vendors to offer robust ATA storage systems. The problem is that vendors push SCSI and Fibre Channel products "because they give the vendors more of an absolute growth margin," Cox says.

He says serial ATA technology will grow into the data center in much the same way SCSI once did.

"I think serial ATA drive technology is a game-changing technology, and you'll see it deployed in more robust storage environments because, while demand for storage is not changing, the money IT managers have to pay for it is," Cox says.

"Twelve years ago, you didn't see SCSI drives in the data center either," says Roy Sanford, EMC's vice president in charge of Centera products.

In April, EMC announced Centera, an ATA-based RAID array for "content-addressed storage," which creates a unique 27-character identifier for each document or image stored in the system.

Waiting for High-End Gear

According to EMC, ATA disk technology was crucial to keeping Centera's price down to about 2 cents per megabyte.

Several start-ups, such as Atto Technology Inc. in Amherst, N.Y., have also been shipping ATA-based products that have data transfer rates of 2G bit/sec. — the same as Fibre Channel arrays.

Unisys is currently reselling Atto's product as part of its Storage Sentinel array, a RAID controller device that comes in a refrigerator-size cabinet with 2TB of internal storage for the purpose of aggregating storage on multivendor storage-area networks.

As of yet, no vendors have stepped up to manufacture an array that will act as high-end primary storage on the same level as EMC's Symmetrix, IBM's Shark or Hitachi Data Systems Corp.'s Lightning arrays.

"As soon as one of the big guys comes out with a product," Cox says, "we'll see them beginning to be used. I'm looking for a leader."

Early Success

SERIAL ATA DISK DRIVES WILL INITIALLY FIND SUCCESS IN THREE MARKETS.

1. Host-based internal storage for low-end, Intel-based servers
2. Entry-level network-attached storage
3. Near-line storage or content-addressed storage, which includes systems that store unchanging data such as X-rays, legal documents or checks

ATA Offerings

A SAMPLING OF ATA PRODUCTS ON THE MARKET:

Unisys sells Storage Sentinel, a RAID controller packaged in a refrigerator-size cabinet with 2TB of internal ATA disk storage to centralize storage on a storage-area network.

EMC sells Centera, an array of ATA disks that uses "content-addressed storage," or software that creates a unique 27-character identifier for each document or image stored in the system. Centera is for fixed content such as X-rays, checks and legal documents.

Network Appliance offers NearStore, an array that has a rack full of hot-swappable 180GB ATA drives for back-up and archives.

Stillwater Inc. in Mountain View, Calif., sells the Excalade 8500-4, 8500-8 and 8500-12 series of RAID controllers. The controllers use the new serial ATA standard along with RAID management software for up to 2TB of disk storage – at half the cost of SCSI disk storage.

Nexsan Technologies Ltd. sells two ATA-based backup storage arrays: the ATAboy and ATAboy 2, which scale to 2.4TB for about $15,000. Nexsan believes ATA disk arrays will eventually replace tape for archiving.

At Comdex next month, Woodland Hills, Calif.-based Nexsan is expected to announce an ATA storage array that will bring disk storage costs to 0.3 cents per megabyte – about the same price as tape today. The company is also expected to announce a high-end ATA array with active fail-over capabilities, full redundancy and hot-swappable drives.

– *Lucas Mearian*

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COLIN JOHNSON

Locking the Data Store

Security will become a bigger issue as more SAN traffic migrates from Fibre Channel to IP, the hacker's playground. By Robert L. Scheier

CATHY GILBERT at American Electric Power Inc. isn't too worried about security on her 2-year-old storage-area network (SAN). There are "very few people in our building that would actually know what to do" to reconfigure her Fibre Channel SAN — assuming they could reach it on its internal private network, which can be administered only from a locked room, says Gilbert, a senior IT architect at the Columbus, Ohio, energy producer.

She uses the built-in configuration capabilities of her EMC Corp. Symmetrix storage arrays, McData Corp. Intrepid Directors and McData Enterprise Fabric Connectivity Manager 6.0 software to control which servers can access which storage devices.

But protecting SANs will become

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more difficult, and more important, as customers begin deploying SANs more widely, to enable the money-saving consolidation of servers, applications and data. And as more SAN traffic migrates from the relatively unknown Fibre Channel protocol to IP, it will become vulnerable to the same well-known attacks used against the Internet and corporate networks.

A recent survey of IT professionals by *InfoWorld*, a sister publication of *Computerworld*, found that security is a source of anxiety when it comes to SANs. Fifty-six percent of the 123 survey respondents who have implemented a SAN — or are planning to — said they're concerned about security. And 63% of the respondents indicated that "improving security through storage centralization" was a factor in implementing a SAN in the first place.

"Like any security, it's something we have to take seriously," says Akhbar Tajudeen, IT director at Alloy Inc., a New York-based marketing company. "We are identifying issues that may not be a problem now but may be a problem two months from now."

Vendors are planning more sophisticated tools such as advanced forms of storage "zoning" and the use of key-based authentication to create "trusted" switches and administrators. Another item on the agenda is the encryption of management traffic.

But how can corporate storage managers prepare for the looming security issues? They can audit their management and configuration policies to ensure that overzealous administrators don't inadvertently cripple their SANs. And they can figure out how to explain SAN security issues to department heads, chief financial officers and security auditors.

Management Woes

With most SANs in relatively small-scale use, many customers can still handle security concerns with common storage management techniques.

One technique is Logical Unit Number (LUN) masking, which limits the logical units of storage (such as volume on a disk) that each server can access. Another is zoning, which divides a SAN into areas where only specified devices (such as hosts, switches and storage arrays) can communicate with one another. In zoning, a device may be identified by its port number or by its World Wide Name (WWN), a unique 64-bit number assigned to each device that's roughly comparable to the Media Access Control address for devices on a data network. And port-type configuration restricts the ability of switches on a port to configure other switches or ports, making it harder for a hacker (or an overzealous administrator) to destabilize the storage fabric by adding devices.

Tajudeen is using IPStor from FalconStor Software Inc. in Melville, N.Y., to link Alloy's 3TB Fibre Channel SAN to its IP-based Ethernet corporate network. Since the storage and corporate networks run on separate network segments, "it would be practically impossible" for a hacker to bridge the two, he says.

Tajudeen says he's more concerned with mistakes, such as an administrator assigning the wrong storage volumes to a host or "removing a client accidentally from the storage that has been assigned to it."

Once you begin attaching multiple systems to a SAN, a key security issue is to make sure those systems don't get in each other's way, says Scott Robinson, chief technical officer at Datalink Corp., a Minneapolis-based firm that designs and implements storage systems.

Simply tracking down and solving such problems is difficult using the different management applications now needed to manage each vendor's products, says Tajudeen, which is why he likes IPStor's single management interface. The complexity of a SAN also makes it important to maintain good change management policies, he says, so the storage staff can easily determine which changes in zoning, or LUN masking, caused a conflict.

Future Threats

SAN security will become a larger problem as companies cut costs by forcing different departments to share storage networks, says Wayne Lam, vice president at FalconStor. In most companies, IT managers from one department don't have the authority to manage data from other departments. But companies often need to commingle data from multiple departments on a single SAN to drive down their storage costs. "You can't afford to have five islands of SANs," he says.

The need for more granular control over who can manage which portions of a SAN is one of the features customers ask for most frequently, says Kamy Kavianian, a product marketing director at Brocade Communications Systems Inc. in San Jose. He says customers also need the following:

- Stronger authentication to verify the identities of both administrators and devices.
- The ability to use a wider variety of methods, such as Telnet and Simple Network Management Protocol, to manage SANs.
- Encryption to protect SAN data from eavesdropping if it crosses public networks such as the Internet.

Authentication — the ability to prove the identity of a person or device — becomes crucial as more users are able to tap into SANs and as data from more sources is commingled in corporate storage networks. Spoofing the identity of a person, or even of a device such as a host bus adapter, is a real threat, Lam says.

Spoofing the identity of a device should be impossible because manufacturers give each device a unique WWN that identifies it to other parts of the storage network, says Lam. But manufacturers deliberately let customers change the WWN through an upgrade to the firmware in the device, he says. That makes it easier, for example, for a customer to replace a switch in a storage network without having to update every device that communicates with that switch's new WWN.

Many vendors are planning key-based authentication to create "trusted" administrators with the authority to manage only a subset, such as a zone, of a corporate SAN. This might be overkill in small environments such as Alloy's, but Tajudeen says, "I could see it being an issue if you have a larger set of administrators."

Encryption may increase in importance as more SAN data migrates from Fibre Channel to IP and as storage over IP allows data to travel farther outside the data center than is possible with Fibre Channel. "It is nice to have certain types of data encrypted," says Tajudeen, but only if the encryption isn't too expensive and doesn't exact too much of a toll on performance.

Building the Business Case

Storage managers must also get ready to explain the intricacies of SAN security to their less-technical peers, says John Webster, a senior analyst at Data Mobility Group Inc. in Nashua, N.H. Some pioneers looking to consolidate corporate data on SANs are facing tough questions from department heads worried about how their data will be kept separate from data generated by other business units, and from chief security officers worried about whether the SAN will be secure from outside threats.

First, "you've got to figure out how, or if, you can overcome" such objections, says Webster, and be prepared to defend your plan in understandable terms. "If you're not prepared to answer them, you can be in trouble," he says.

Scheier is a freelance writer in Boylston, Mass. He can be reached at rscheier@charter.net.

SAN Security Glossary

Fabric: The hardware and software that connect a network of storage devices to one another, to servers and eventually to clients.

LUN masking: Using the Logical Unit Number (LUN) of a storage device, or a portion of a storage device, to determine which storage resources a server or host may see.

Port: A physical connection on a storage switch that links that switch to storage devices, servers or other switches. Many SAN security techniques limit which devices a port can connect to or the manner in which it connects to those devices.

Spoofing: Impersonating the identity of an individual (such as a storage administrator) or of a device (such as a storage switch) to gain unauthorized access to a storage resource.

Trusted switch: A switch within a storage network that uses a digital certificate, key or other mechanism to prove its identity.

VSAN: A virtual SAN, which functions like a zone but uses a different layer of the Fibre Channel protocol to enforce which devices in the fabric can speak to other devices.

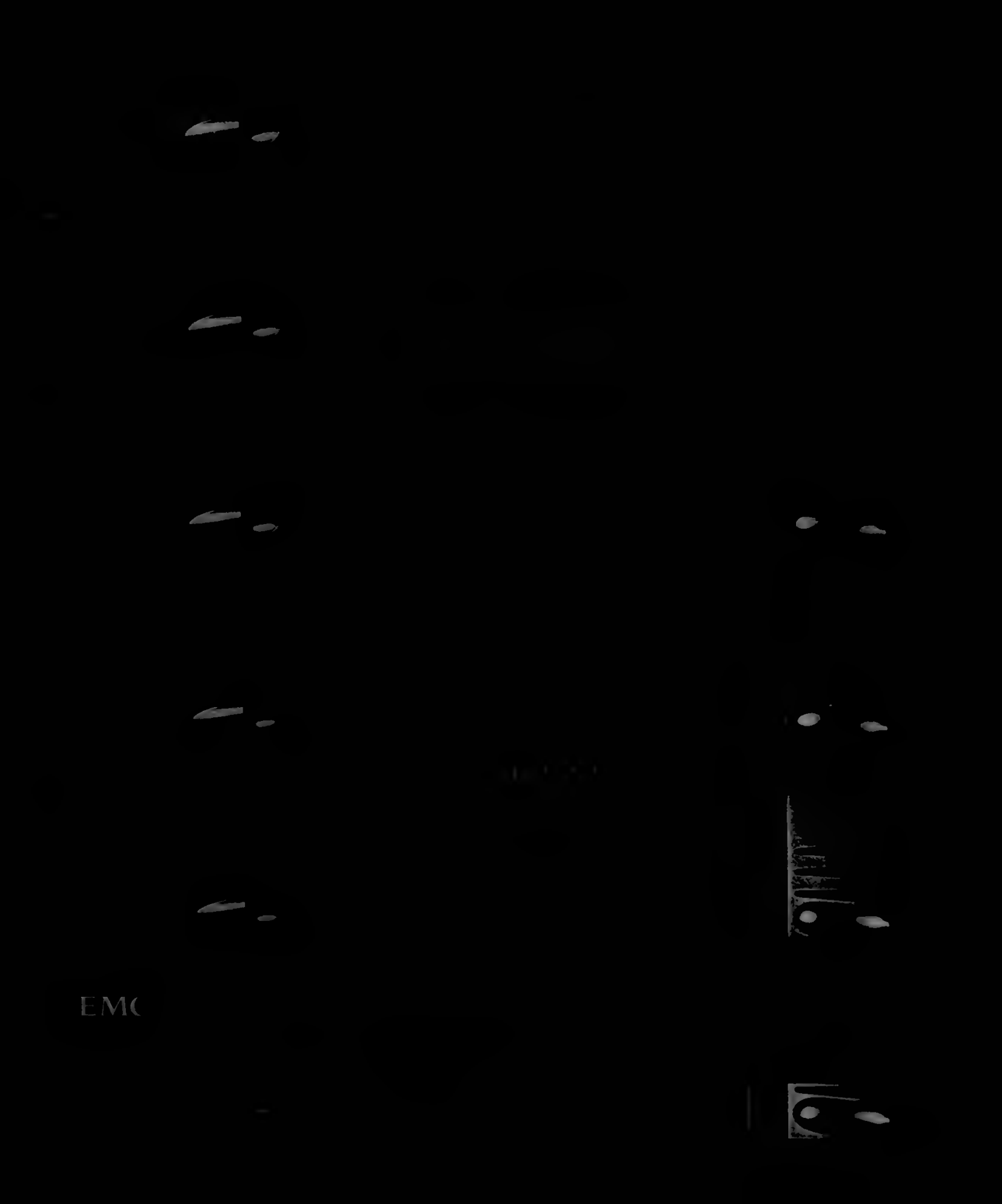
World Wide Name: A unique numeric identifier for a device on a storage network, such as a disk array or a switch.

Zone: A collection of Fibre Channel device ports that are permitted to communicate with each other via a Fibre Channel fabric.

HELP ON THE WAY?

Vendors such as Brocade, Cisco and FalconStor are trying to address storage security in their product lines.

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Companies are scrambling to marry their storage and disaster recovery strategies via data replication. By Mark Leon

Cloning Data for Disaster Recovery

EVEN BEFORE THE SEPT. 11, 2001, terrorist attacks and the temporary shutdown of the nation's airlines, IT managers were beginning to use the words *disaster recovery* and *storage* in the same sentence, especially in the financial services industry.

But afterwards, the marriage of the two disciplines seemed even more urgent. The potential for disasters seemed bigger, and disaster recovery plans that called for flying tapes across the country seemed naive.

The result is that the words *disaster recovery* are now actually driving many storage technology projects, as corporate IT managers look for ways to replicate data and send it to sites that are 10, 20 or even hundreds of miles from headquarters. Here are three technology strategies they're using.

1 The Storage Subsystems Approach

When Lajuana Earwood began looking for a new disaster recovery system, she found she was alone. "No one else had done what we were trying to do — we wanted to mirror massive amounts of data over a very long distance, about 700 miles," she says.

Earwood, director of mainframe systems at Norfolk Southern Railway Co. in Norfolk, Va., realized in January 2001 that the company's business systems were too vulnerable. "At the time we were replicating a small subset of our data in real time," says Earwood. "But it was not really enough to carry us through in the event of a major disaster."

The data sets amounted to about 6TB of critical railroad, payroll and order entry information on two IBM mainframes — essentially the railroad's IT hub. So Earwood sent out a bid request to all the major storage vendors; Hitachi Data Systems Corp. in Santa Clara, Calif., got the job in February 2001. "IBM's proposal would have required too much additional hardware," says Earwood. "EMC's solution gave only snapshots. HDS gave us the closest thing to real-time mirroring, and it required less hardware."

And she liked the price. By January 2002, the new system was good to go.

Along the way there was one major change in direction, though. The original plan was to replicate to

Continued on page 38

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Business Continuity Tips

- **Decide on your recovery objectives** before selecting technologies and spending money.
- **Don't neglect the people part of business continuity.** The best data replication system in the world won't help if your people aren't trained and in place to take advantage of it.
- **Leverage the infrastructure you already have.** For example, if you have dark fiber in place, it might be cost-effective to go with a high-end SAN and Dense Wave Division Multiplexing for data replication.
- **Consider that if a disaster occurs** and you have to use the airlines to get to a remote site, your recovery time will increase – if you can fly at all.

SOURCES: PAUL HONEY, DIRECTOR OF GLOBAL CONTINGENCY PLANNING AT MERRILL LYNCH & CO. INC. IN NEW YORK; RICHARD BONDER, INTER NETWORKING CONSULTANT AT CAMBRIDGE TECHNOLOGY PARTNERS INC., WHITE PLAINS, N.Y.; CHARLIE OLIVER, DIRECTOR OF GLOBAL INFRASTRUCTURE SERVICES AT EASTMAN CHEMICAL CO., KINGSPORT, TENN.

a site in North Bergen, N.J., about 700 miles away. "But after Sept. 11, we realized that might not be such a good idea. The logistics of transporting personnel could effectively negate all our other efforts," Earwood says. So Norfolk Southern decided instead to use a much closer backup center in Buckhead, Ga., for the mirrored mainframe data.

The sheer volume of data presented another challenge. "We wanted to put all our data in one consistency group," says Earwood. A consistency group is a set of data that is shared by a number of critical applications, but in Norfolk's case all of the data is shared by all of the applications. It made sense on paper, but the execution pushed the technology envelope a bit too far.

"We are using HDS 9960 storage hardware, the HDS TrueCopy replication software and two OC3 network pipes," says Earwood. "It all worked, but we kept hitting the ceiling on high-volume write transactions."

The solution was to split the data into three consistency groups. But Earwood isn't giving up on the original goal. "We are looking at new hardware from HDS that can handle more volumes. This might allow us to consolidate all our data back to one consistency group," she says.

Earwood tests the system with a simulated disaster recovery almost every week. "We are almost down to a four-hour recovery time," she says, "and we now feel that we can go to our board of directors and say that we have confidence in our disaster recovery system."

2 Host-based Software

When Chadd Warwick, operations manager at Comprehensive Software Systems Inc., a financial software development house in Golden, Colo., went shopping for a new business continuity system, he wanted something a little more flexible than the hardware-based systems from vendors such as Hitachi and Hopkinton, Mass.-based EMC Corp.

He found it in Veritas Volume Replicator (VVR) software from Veritas Software Corp. in Mountain View, Calif. "We liked VVR," says Warwick, "because it is a host-based, software solution."

Because the software runs on the server instead of on the disk array, it's independent of the storage hardware. "It meant we didn't have to forklift a new hardware infrastructure in, which meant lots of savings for us," says Warwick.

Warwick started using VVR in November 2001 as a beta tester and decided to stick with it. "This is block-level data replication so the software doesn't need to know anything about the applications or the data. And the hardware independence is really nice," he says. "You can actually restore to different hardware, so, in the event of a major disaster, we could even run down to Best Buy and pick up whatever machines we could find to get us up and running quickly."

Another advantage, Warwick says, is the absence of complex, proprietary network protocols. "VVR uses standard IP," he says. Currently, the company replicates about 400MB to 1GB of data per day — over T1 and T3 lines — from the data center in Golden to a site in downtown Denver.

The software approach is usually cheaper than subsystems products, especially for replication over long distances, says Bob Guilbert, vice president of NSI Software Inc. in Hoboken, N.J., which competes with Veritas. "The subsystems products typically require dedicated fiber, and that can get very expensive."

3 The Hybrid: SAN Over IP

Shimon Wiener, like many of his peers, started looking for a better way to protect his firm's data after the terrorist attacks of Sept. 11, 2001. Wiener is the manager of the Internet and networking department at Mivtachim, a leading provider of pension insurance in Ramat Gan, Israel. It's a part of the world where, unfortunately, disasters aren't a rare occurrence.

The firm has two data centers: one with 600MB, in Ramat-Gan, and the other with 400MB, about seven miles away in Tel Aviv. "We wanted to do a double replication," says Wiener, "so if Tel Aviv goes down, Ramat Gan can take over, and vice versa." But when Wiener went shopping, he was dismayed at the high prices. "We first looked at Compaq, IBM and EMC. None of them could do this without a Fibre Channel connection, which was very expensive," he says.

Wiener finally found what he wanted from Dot Hill Systems Corp. in Carlsbad, Calif. Mivtachim wanted a storage-area network (SAN) at each site, and Dot Hill's Axis Storage Manager software supports IP replication for SAN-based systems.

Beginning in January, the pension company installed the Dot Hill SANnet 7100 hardware in Ramat Gan and a second SANnet 7100 in Tel Aviv, and then started replicating between sites. Testing lasted about four weeks. "Initially, we had some problems getting the two systems synchronized," says Wiener, "but we had good support and now we are very satisfied. We replicate about once a day."

Although Wiener got the system for disaster recovery purposes, he says it had a significant side benefit: "The SAN also centralized our data so backups are much easier to manage."

Leon is a freelance writer in Kilauea, Hawaii.

Prepare for Transportation Disasters, Too

AT EASTMAN CHEMICAL CO. in Kingsport, Tenn., managers realize that disaster recovery times have to take into account distance and transportation problems.

The company had two backup sites, one with IBM in Gaithersburg, Md., and one with Sungard Data Systems Inc. in Atlanta. "Twice a year we would load tapes and ship them to these locations," says Charlie Oliver, director of global infrastructure services at Eastman Chemical. But, even before the Sept. 11, 2001, tragedy shut down most transportation, Oliver realized this wasn't adequate.

In early 2001 he got board approval for a second site about 30 miles away in Johnson City, Tenn., and went live with the new site in March 2002. The chemical company selected EMC Corp.'s Symmetrix hardware and the EMC Symmetrix Remote Data Facility software, and it links the two sites with a Dense Wave Division Multiplexing telecommunications pipe.

Oliver says the architecture provides more than business continuity insurance. "We replicate all our ERP and other mission-critical systems, but we also load-balance between the two, so one is not just a backup of the other," he says.

Maintaining two active, load-balanced sites results in better customer service. "Most routine failures are now invisible to our customers, since the transaction is automatically switched to the other site. We can offer extreme high availability," Oliver says.

High availability is a nice side benefit, but Oliver says the most important thing to consider when designing a new business continuity system is the nature of real disaster.

"I often hear people say, 'I can recover my environment in 24 to 48 hours,' but what they don't think about are all the other services that may go down. Lots of my colleagues count on being able to fly to a remote site, but that time is in addition to the estimated recovery time. So think about where that recovery site is located," Oliver cautions.

–Mark Leon

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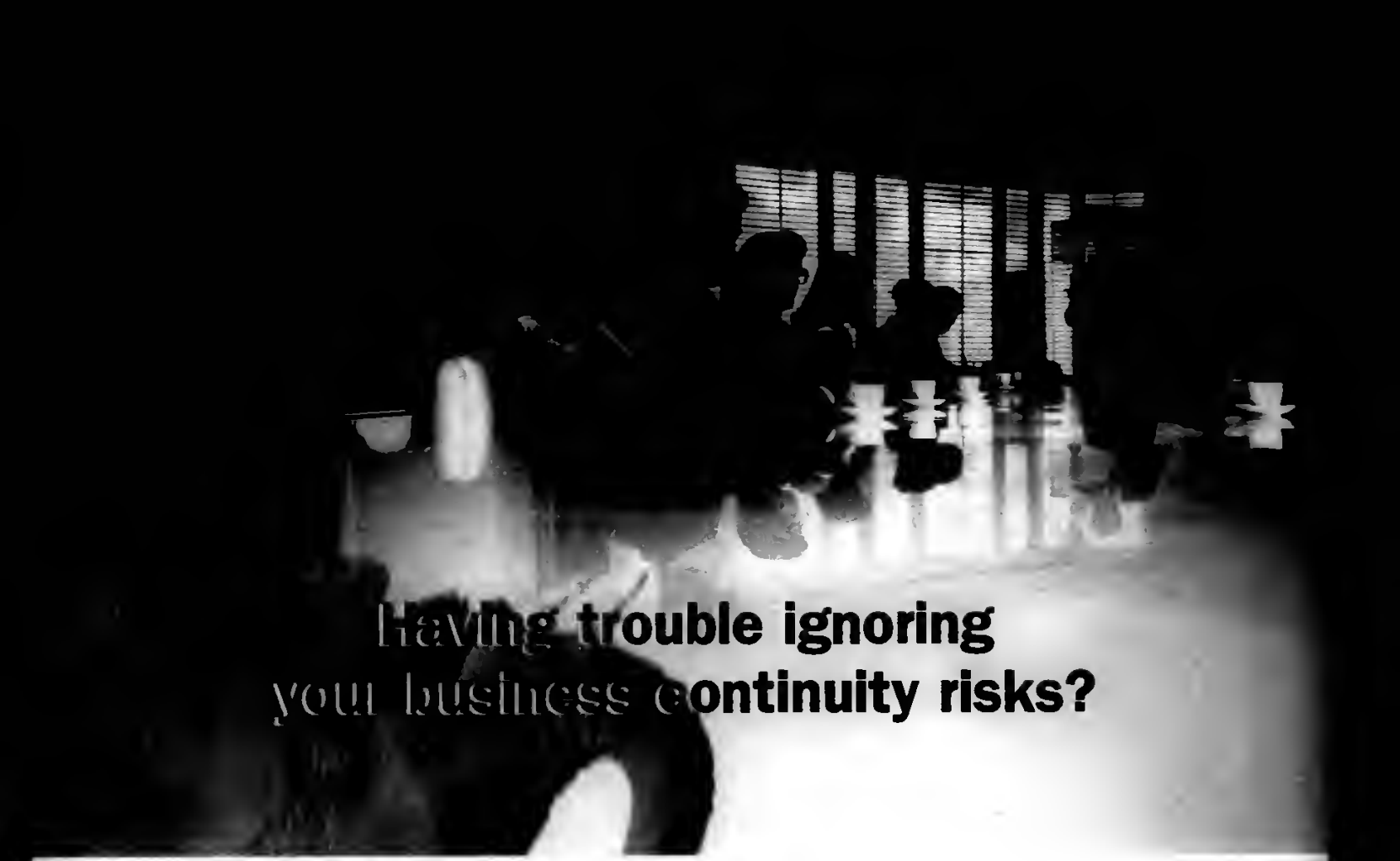
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Backups Get Better



Tapes Get Bigger, Faster

Until a few years ago, the tape industry lacked standards, with each vendor providing its own media and tape drive technology. Today, the following three formats dominate:

Linear Tape Open (LTO): Launched in August 2000 by IBM, Seagate Technology LLC in Scotts Valley, Calif., and Hewlett-Packard Co., LTO nearly doubled tape cartridge capacity to 100GB and offered data transfer speeds of 10MB to 15MB/sec., which were equal to or better than previous products.

Digital Linear Tape (DLT): Milpitas, Calif.-based Quantum Corp.'s DLT offers a 110GB capacity and a data transfer rate of 11MB/sec.

Advanced Intelligent Tape (AIT): Developed by Sony Corp. in Tokyo, AIT supports 100GB per 8mm tape and transfers data at 12MB/sec.

Today's products aren't keeping up with users' multiterabyte storage needs. IBM's recently announced 1TB tape cartridge could help. But the vendor is still working on improving data transfer rates for the new format, so we aren't likely to see a product for three to five years.

Despite enormous leaps in tape subsystem and hierarchal storage management technologies for enterprise backups, most IT managers still use direct-attached tape drives that require lengthy backup windows when administrators insert and remove multiple tapes as backups run.

And as the number of low-cost Windows and Unix servers has grown, IT managers have simply added more independent tape drives, increasing management complexity.

TECH CHECK

The move toward data consolidation on storage-area networks and network-attached storage devices has enabled administrators to add automated tape libraries (ATL), which reduce backup times of these larger, consolidated data sets by using multiple tape drives to write backups concurrently to hundreds of cartridges within a single ATL.

But while tape libraries have consolidated storage, backups still shut down applicatioo servers for an average of 14 hours, according to Robert Amatruda, an analyst at IDC in Framingham, Mass. And administrators may wait tens of seconds to restore a file from tape (once it's mounted) and several minutes to retrieve several files. "It just takes forever to get to your data," Amatruda says.

Disk in the Middle

That's led to the recent trend of positioning tape as an archival solution only and using disk drives as both backup storage and as a tape buffer for archiving. The cost of Advanced Technology Attached disk drives has dropped to the point where they're cheaper than SCSI drives by a factor of three. This makes them an attractive alternative for backup storage.

Disk-to-disk backup systems support rapid data restoration at disk speeds and can function as near-line storage devices. For archival backups, the systems act as a cache between the primary storage and tape subsystem, so that the lengthy backups needed to stream to tape don't tie up the primary storage devices.

Vendors of disk-to-disk backup products, such as Sunnyvale, Calif.-based Network Appliance Inc., advocate backing up data exclusively to the backup appliance for a period of time — days or weeks — and creating less frequent tape backups for archival purposes.

"That data is on the disk for a few days," says Robert Abraham, an analyst at Freeman Reports in Ojai, Calif. "After that time, the likelihood you'd need it to restore diminishes quickly. The user most likely would take the data off the disk and put it on tape. That frees up disk space so that [the disk backup system] only has current data."

High Price Tags

Using disk-to-disk backup systems as a buffer for tape backup can eliminate the problem of long backups that tie up primary storage. But the systems aren't cheap; they can cost $275,000 or more, depending on capacity.

For companies with mainframes, the problem of tape storage is exacerbated by the fact that tape drives have been limited to holding one data set per cartridge, often leaving the majority of tape unused.

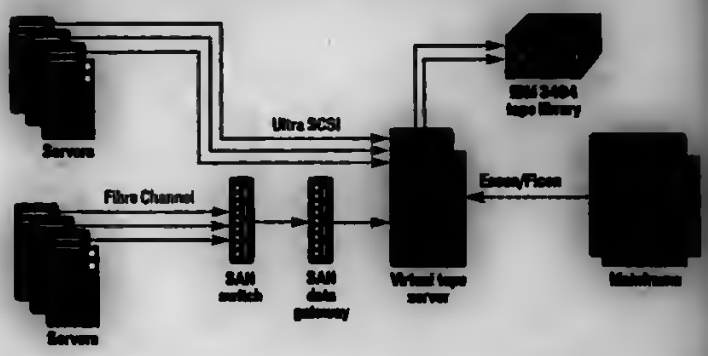
Virtual tape servers resolve that. These systems combine a tape library with a caching disk array and special storage management software that makes the array look like a tape library to the host. They can also stack multiple data sets on a single cartridge, filling each cartridge to capacity and saving space. IBM's current virtual tape server, for example, can emulate up to 256 tape drives. Virtual tape servers rely on higher-performance SCSI arrays and support both Fibre Channel and mainframe interfaces such as Escon. A typical installation may cost $250,000 or more.

"I think things like near-line and virtual storage are for a group of users that have a lot of infrastructure and a lot of money that's outlaid to help in that regard," Amatruda says. "Virtual tape is still a high-cost support-and-deploy solution. Your average systems guy doesn't have that."

If subsystem prices continue to fall, that could eventually change. "At the end of the day, you'll still find more of a blended solution. You will have disk and tape operating much closer to one another in terms of backup function," Amatruda says.

IBM's Virtual Tape Server Architecture

IBM's virtual tape server emulates a tape library but backs up data to a disk array before migrating it to tape. Other vendors use similar designs. Unlike disk-to-disk backup systems, virtual tape server systems use high-performance SCSI drives and include mainframe interfaces.



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"That data is on the disk for a few days," says Robert Abraham, an analyst at Freeman Reports in Ojai, Calif. "After that time, the likelihood you'd need it to restore diminishes quickly. The user most likely would take the data off the disk and put it on tape. That frees up disk space so that [the disk backup system] only has current data."

High Price Tags

Using disk-to-disk backup systems as a buffer for tape backup can eliminate the problem of long backups that tie up primary storage. But the systems aren't cheap; they can cost $275,000 or more, depending on capacity.

For companies with mainframes, the problem of tape storage is exacerbated by the fact that tape drives have been limited to holding one data set per cartridge, often leaving the majority of tape unused.

Virtual tape servers resolve that. These systems combine a tape library with a caching disk array and special storage management software that makes the array look like a tape library to the host. They can also stack multiple data sets on a single cartridge, filling each cartridge to capacity and saving space. IBM's current virtual tape server, for example, can emulate up to 256 tape drives. Virtual tape servers rely on higher-performance SCSI arrays and support both Fibre Channel and mainframe interfaces such as Escon. A typical installation may cost $250,000 or more.

"I think things like near-line and virtual storage are for a group of users that have a lot of infrastructure and a lot of money that's outlaid to help in that regard," Amatruda says. "Virtual tape is still a high-cost support-and-deploy solution. Your average systems guy doesn't have that."

If subsystem prices continue to fall, that could eventually change. "At the end of the day, you'll still find more of a blended solution. You will have disk and tape operating much closer to one another in terms of backup function," Amatruda says.



Backup Vendors Offer Array of Alternatives

VENDOR BACKUP OFFERINGS FALL INTO THREE KEY AREAS. THESE INCLUDE:

Disk-to-Disk Backup

Disk-to-disk backup systems typically work like network-attached storage devices and can perform backups as a simple file copy.

On the high end, Sunnyvale, Calif.-based Network Appliance Inc.'s NearStore R100 array sells for $275,000 for a 12TB unit.

The $45,000 Quantum DX30, from Quantum Corp. in Milpitas, Calif., supports up to 3TB of backup storage. It emulates a tape drive to work with third-party backup software.

On the low end, the ATAboy, from Woodland Hills, Calif.-based Nexsan Technologies Ltd., starts at about $10,000 for 500GB of storage and scales to 2.5TB.

Virtual Tape Servers

Virtual tape servers offer tape caching capabilities similar to those of disk-to-disk backup systems, but they also support the mainframe arena.

IBM's TotalStorage Virtual Tape Server (VTS) is the heavyweight here, with about 89% of the market, according to Framingham, Mass.-based IDC. The other major competitor is Louisville, Colo.-based Storage Technology Corp., with its V960 Shared Virtual Array disk system.

COMPETITORS

IBM's integrated system consists of a high-performance VTS disk cache controller and tape management software, plus adapters for connecting to host servers and an IBM 3494 Enterprise Tape Library (see diagram). A fully configured VTS system runs about $250,000.

Automated Tape Libraries

Some 20 vendors offer about 3,000 automated tape library (ATL) products, ranging from autoloaders to full-size ATLs with tens of tape drives and hundreds of tape cartridges.

The leading vendors, IBM and StorageTek, sell a full range of products. Quantum, Redmond, Wash.-based Advanced Digital Information Corp. and Overland Storage Inc. in San Diego focus on the midrange backup systems.

Noticeably absent is Hewlett-Packard Co., which announced that it's exiting the ATL business. HP will continue to sell libraries but won't manufacture them, says Bob Abraham, an analyst at Freeman Reports in Ojai, Calif.

Disk Appliance Closes Backup Window

James Riis, CIO at Miami-based BayView Financial Trading Group LP, was struggling with a 24- to 30-hour window during which more than 100 Windows NT and Unix application servers had to be offline in order to perform a full backup of 5TB to 6TB of data that included mortgage documents, financial spreadsheets and other mission-critical information.

"And when we wanted to do a restore, a person had to wait eight to 12 hours before we could put a file out there," Riis says, referring to the task of retrieving files from the company's direct-attached tape backup systems.

FIELD NOTES

Riis addressed both problems by installing a NearStore disk-to-disk backup storage appliance from Sunnyvale, Calif.-based Network Appliance Inc. The device acts as a buffer between a high-speed tape library from Boulder Colo.-based Spectra Logic Inc. and BayView's servers. The Spectra 12000 uses Advanced Intelligence Technology tape drives from Sony Corp. that connect via Fibre Channel directly to the 12TB NearStore R100.



"We do daily incremental backup of all changes on the R100. We do daily full backups of databases and the transactional log and then a weekly full backup of the R100 file system," Riis says.

The NearStor appliance reduced backup times from 24 hours with tape to just three by going to disk. The tape backups then continue from the NearStor to the tape library. Archival backups to tape require six to eight hours to complete but are performed off-line.

And Riis found another use for the device: near-line storage. "When a [broker] needs a copy of a spreadsheet, they need it within a few minutes of calling us," Riis says. "We needed something that was sort of online storage that would be a lot cheaper than a typical disk appliance."

Besides offering up customer and business data to brokers, the NearStor device also stores and serves document images that, says Riis, had forced "several hundred people to wait minutes" when they had been stored on a optical disk jukebox.

The NearStore appliance cost about $300,000, but Riis says it was worth the money because it saves time and simplifies backup jobs. "It's an expensive capital investment . . . [but] it sure beats having to go back and look through 40 tapes to find data," he says.

Tape Consolidation Cuts Costs

PACCAR Inc. knows all about big machines. The manufacturer of Kenworth and Peterbilt tractor-trailers uses three massive 9310 PowderHorn tape libraries from Storage Technology Corp. to back up its IBM mainframes. But the Bellevue, Wash.-based company didn't have a consolidated backup system.

FIELD NOTES

Barbara Newell, a technology consultant at PACCAR, says nightly backup of between 4TB and 6TB of data residing on more than 100 servers was still being performed using direct-attached tape drives and required 12 hours to complete.

"We would try to start at 10 p.m., and one full-time operations person would be assigned to [swap out tapes] until 6 a.m.," Newell says.

To solve the problem, PACCAR began rolling out a Fibre Channel network last year. The company installed 20 StorageTek 9840 and 9840B Fibre Channel tape drives, which use 20GB tape cartridges. It then installed Fiber Channel cards in each server and set up NetBackup from Mountain View, Calif.-based Veritas Software Corp. to back up each server's data over the Fibre Channel fabric.

Newell says configuring the Fibre Channel switches was a challenge, as was loading NetBackup on each server and learning the product.

She also had trouble getting a Windows NT server, which controls the robotic tape-changing functions in the PowderHorn drives, to communicate with PACCAR's OS/390 mainframe.

"We all know how well NT boxes talk to mainframe boxes. It took a lot of time to get that software working between the two systems," she says.

Once the system was up and working, Newell says the storage-area network reduced full system backups from eight hours to three, and it's now feasible to perform incremental backups.

"The Fibre Channel drives are unbelievable. They've got a throughput of 10MB/sec.," Newell says. "And we're able to put more servers on our network without growing the backup window. It gives us the flexibility."

She says PACCAR has seen a 39% return on its investment, measured in reduced labor and a decrease in the number of tape drives used. Another benefit: PACCAR no longer needs to go off-site to perform a restore from warehoused tapes. "Now we're able to do the restores via vaulting," Newell says. "The original [copy] is kept on-site, and another copy of it taken off-site. We can do restores in minutes compared to hours. Operations loves that."

WHO'S WHO

For a list of vendors of tape backup systems, visit our Web site:

QuickLink 33423
www.computerworld.com

Direct Access File System

DEFINITION:

The Direct Access File System (DAFS) is a developing protocol for storing and accessing files. Under DAFS, data is transferred directly from storage to client as logical files, not physical storage blocks. DAFS improves performance significantly because the request and its fulfillment bypass the server kernel and go directly to the file system.

BY RUSSELL KAY

MORE STORAGE, now. And make it faster! The explosion of data gathering in today's online business environment means that your storage requirements keep going up, and the amount of data that you need to process and analyze also grows. Unfortunately, the tools we've developed and implemented so far are having a hard time keeping up.

The answer may be the Direct Access File System (DAFS), a protocol that recognizes the speed and reliability of today's Gigabit Ethernet and InfiniBand protocols, provides for remote direct memory access (RDMA) between applications running on separate machines in a cluster or LAN, and is built around files, not blocks.

To understand DAFS better, let's review the differences between a storage-area network (SAN) and network-attached storage (NAS). A SAN is a complete subnetwork dedicated to storage and is connected to one or more servers. Connections to a SAN are made over a high-speed protocol such as Fibre Channel or iSCSI. SAN storage is accessible from all servers, so users can access any storage device on the SAN, regardless of the physical location of the storage or users. SANs were designed to help manage and speed storage by simplifying the data path and taking hard-wired servers out of the loop, but they move data in low-level blocks, thus necessitating a translation to files to use the data.

QUICK STUDY

NAS is simpler than a SAN; basically it's shared, hard-disk storage that's given an integral, dedicated server and its own network address. A NAS appliance attaches to a network without powering it down and requires no changes to the existing file servers. NAS was designed to make it easy and inexpensive to add storage, and data is handled in files, the way the user expects.

Unfortunately, both systems incur considerable processing overhead, which slows data transfers.

DAFS uses the Virtual Interface (VI) architecture, which was designed in 1996 by Microsoft, Compaq and Intel as a data transport mechanism. VI is a high-speed, low latency (i.e., low waiting time) network protocol that lets applications on different machines in a LAN or cluster read and write to memory addresses used by other applications in the network. This memory-to-memory interconnect is called RDMA.

DAFS also reads and writes using a file-based protocol, so it preserves information that would otherwise have to be rebuilt every time it's fetched. File requests to open, update, append, lock or close are exchanged between users' storage clients and storage servers.

Thus DAFS combines the speed of a high-speed SAN and the simplicity of file-based NAS, and does it with lower overhead than either (see diagram below).

DAFS's file-based storage can be managed by several different types of products and also promises to remove some of the internal processing that current block-based databases must perform.

History

Early work on DAFS was done by Network Appliance Inc. in Sunnyvale, Calif. DAFS is now spearheaded by an 80-plus member industry association called the DAFS Collaborative. The collaborative has completed Version 1.0 of the DAFS specification and turned it over to the Internet Engineering Task Force standards group and to a newly created DAFS Implementors Forum, a subgroup of the Storage Networking Industry Association.

DAFS was first demonstrated in action with an Oracle database in December 2001, but no products have yet reached the market, making it unclear whether DAFS will succeed. Some NAS and subsystem companies don't believe that DAFS is really an open standard, but others believe that it's a genuine step in the evolution of NAS technology that could deliver significant benefits.

Kay is a contributing writer in Worcester, Mass. You can reach him at russkay@charter.net.

Storage Technologies

PROTOCOL		TYPE OF INTERCONNECT: Direct Memory Access	Server via TCP/IP
BLOCK STORAGE		Local-attached storage SAN	iSCSI
FILE STORAGE		DAFS	NAS

SOURCE: DAFS COLLABORATIVE

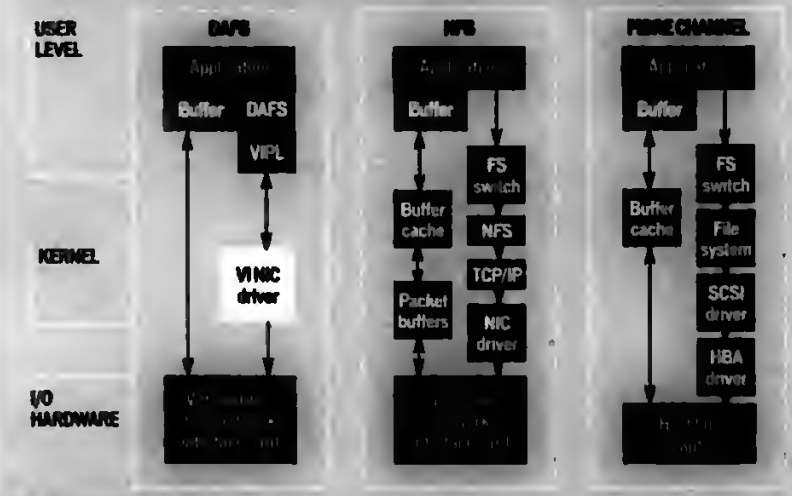
STORAGE ARCHIVES

For previous *Computerworld* coverage of storage, visit our Web site:

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How DAFS Compares With Legacy Technology

DAFS bypasses traditional kernel driver processes. The advantage that DAFS brings is greatly reduced overhead in terms of network processing by host systems. Red arrows indicate data flow; black arrows indicate control flow.



SOURCE: DAFS COLLABORATIVE


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Virtual Promises

Storage virtualization sounds great, but confusion and interoperability problems are hindering adoption. By Bob Violino

AT A GLANCE

Storage Virtualization

DEFINITION: The ability to pool heterogeneous storage subsystems and manage them as a single entity while decoupling the logical data access from the physical data mapping via an intermediary access utility.

BUSINESS VALUE: Policy-driven storage applications will reduce the cost of storing data, eliminate the backup window and triple the amount of storage that can be managed by a single administrator.

PREDICTION: Despite the vendor hype, rich virtualization functionality won't be fully realized before 2004 or 2005.

TWO ARCHITECTURES:

1 **IN-BAND:** Virtualization logic resides on a server between the application/database host and the switched fabric. All logical data requests pass through this virtualization server and are translated into physical storage requests. PRO: Allows sophisticated data manipulation. CON: Both the data and metadata pass through the virtualization server, which can be a performance bottleneck.

2 **OUT-OF-BAND:** The dedicated virtualization engine is connected directly into the SAN fabric and application servers via a LAN, with only the metadata passing through the virtualization engine. PROS: Simple, low-cost, possibly higher performance. CON: Less functionality and sophistication because it doesn't control the data itself.

SOURCE: META GROUP INC., STAMFORD, CONN.

STORAGE VIRTUALIZATION is a technology that holds much promise for IT managers, who see it as a way to give users a pool of virtual storage that would ease some of the headaches associated with managing a large, multivendor storage infrastructure.

Yet while some companies are using virtual storage products for certain applications, many are still holding back. Several factors, including ongoing marketplace confusion, interoperability problems and a lack of standards, are hindering the widespread adoption of the technology.

Storage virtualization was designed to let managers easily add and manage storage from multiple vendors and to allow any application or system to immediately access a pool of storage. Because virtualization software was designed to deliver storage on different devices as one central pool, management of storage should be easier.

But experts say that the technology is immature and that there's confusion about which vendors are offering true virtualization and to what extent. Part of the confusioo comes from the term *storage virtualization* itself, which means different things to different vendors. Vendors apply different degrees of virtualization to their products, and they can deploy it in differeot places such as the host or in storage-area network (SAN) components.

The Storage Networking Industry Association (SNIA) has drafted a broad definition of *storage virtualization*, but there remains a lack of clarity in the marketplace.

"There's a lot of confusion and a lack of good data identifying the optimal place to layer in [virtualization] technology," says Steve Pomposi, head of storage management at insurance company Aetna Inc. in Hartford, Conn.

> **"To date, we have not seen huge demand for storage virtualization."**
>
> ANDERS LOFGREN, ANALYST, GIGA INFORMATION GROUP INC

What can be done to help clarify things? "First, vendors should clearly articulate what they specifically mean by *virtualization*; for example, what functions are they providing, and what problems are they solving," says Steve Duplessie, an analyst at Enterprise Storage Group Inc. in Milford, Mass.

An even bigger problem is a lack of interoperability among storage virtualization products designed for different computing environments.

"There's a lack of heterogeneous support across not just storage platforms, but servers and server software that assists in the management of storage," says Pomposi. "There are [virtualization] solutions out there that are starting to make sense for homogeneous Windows environments where you're running similar software across a variety of servers. But when you include a Unix environment, it becomes very problematic."

There's also an issue of melding virtualization with existing storage management applications. "A lot of the functionality in virtualization products could become substitutes for products companies are already using and are happy with," says Anders Lofgren, an analyst at Giga Information Group Inc. in Cambridge, Mass. "They have to consider integrating with other storage platforms."

Many believe that industry standards will help vendors achieve greater interoperability, and there are some positive signs. The SNIA has been pushing a standard based on the Common Information Model (CIM), and that effort is gaining momentum [QuickLink 29986].

But for the most part, IT departments are taking a wait-and-see approach to virtualization.

"To date, we have not seen huge demand for storage virtualization," says Lofgren. "The technology looks great, and if you're using it on a tactical basis to solve a specific problem, that's fine. But I think [broader] implementation is still in the future. We're recommending that companies hold off making evaluations of the technology as a strategic storage platform for at least another 12 months."

Aetna's Pomposi agrees. "It would be extremely risky at this point for a large corporation to jump into this in a big way," he says.

Still, virtualization is attracting established storage vendors and start-ups, as well as actual users.

Community Health Network in Indianapolis is using a networked storage virtualization product from DataCore Software Corp. in Fort Lauderdale, Fla., to store information such as patient records. Community Health Network, which comprises four hospitals and more than 60 other health care facilities in central Indiana, installed a primary SAN and a second SAN for disaster recovery.

DataCore's storage networking and virtualization software manages 6TB of capacity. Chris Stewart, team leader for enterprise storage, says the software consolidates heterogeneous storage resources into a virtual pool, allowing Community Health Network to access needed storage over an Ethernet link.

"With virtualization, we can present one or two terabytes of storage for any kind of hardware and only use that storage space that a particular application needs," Stewart says. "Before, we were burning a lot of storage disks. This gives us more flexibility." Community Health Network plans to move other applications to the SAN during the next month or so.

Violino is a freelance writer in Massapequa Park, N.Y.

BLUEFIN TO THE RESCUE

The storage industry's Bluefin standards effort is expected to solve some of the interoperability problems that have plagued storage virtualization.

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WebSphere software

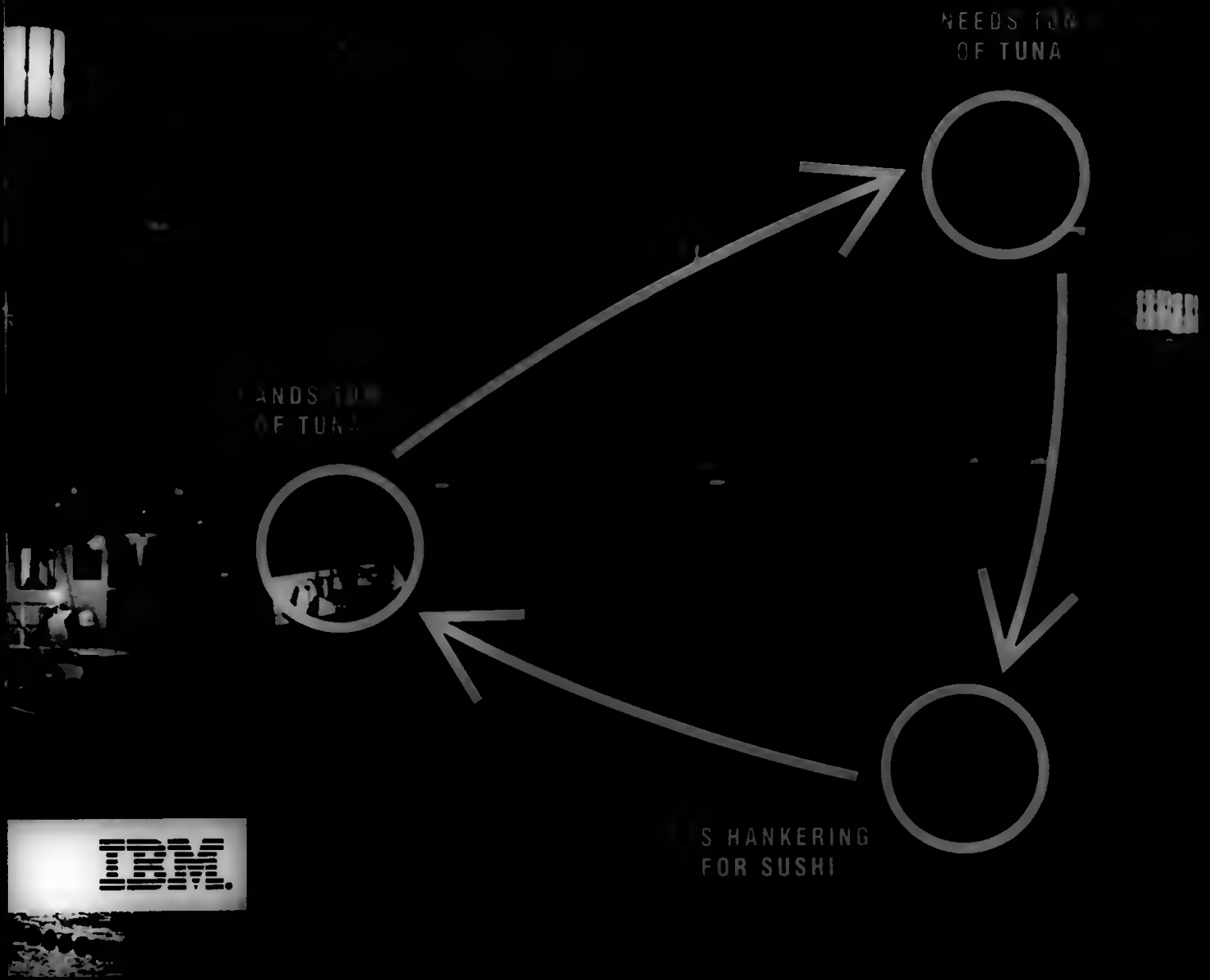
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The Data Keepers

What you need to know to land a job and keep your skills fresh in the storage field. By Steve Ulfelder



Employer Spotlight

State Farm Insurance Cos., the largest insurer in the U.S., has hundreds of terabytes of stored data to tend, according to Eric Ogilvie, the manager responsible for enterprise storage at the company's Bloomington, Ill., headquarters. With four data centers in the U.S. and one in Canada, it's no wonder State Farm has frequent job openings in the storage arena.

One State Farm IT group focuses on designing and planning storage systems, while another handles daily functions such as monitoring the backup-and-recovery infrastructure and following up on component failures. A subset of this group performs hands-on tasks, Ogilvie says: "They're the folks who actually install the fiber for a SAN and configure the hardware from a disk-array perspective."

These groups form a natural career ladder, Ogilvie says; it's common for storage workers to start out running fiber and progress to a point where they're designing storage-area networks (SAN). "In the past, a Unix or Windows expert would naturally see his career path as [operating systems]-related. But with storage, you use all those OS skills and then some," he says.

State Farm keeps storage staffers interested with leading-edge projects such as SANs and network-attached storage (NAS). "We haven't bought any NAS devices," Ogilvie says, "but we've built our own NAS solution using rack servers and mass storage devices to get the same benefits."

– Ulfelder is a freelance writer in Southboro, Mass. Contact him at sulfelder@yahoo.com

Best Place

- www.supervalu.com
- Food retailer and distributor
- **Ranked No. 61** on *Computerworld*'s 2002 Best Places to Work in IT list
- **2001 revenue:** $20.9 billion
- **Number of IT workers:** About 1,000
- **Manager's view:** Think storage is a sleepy field? Don't tell that to Bill Voegele, manager of Supervalu's enterprise storage group. His department just finished a major upgrade of its 11TB SAN. In the overhaul, Supervalu swapped in four newer directors with double the capacity of the ones they replaced and doubled the SAN's open ports to 256.

What Voegele says he's proudest of is that all this was done while the system was online. "We just touched 11TB of application data without anybody knowing about it," he says.

Credit also goes to Supervalu's management, which understands the value of company data. "The storage area is viewed as the technical leader in the organization," says Scott Larson, director of technical services.

Voegele's group didn't get much of a breather. "We're now consolidating our storage footprint – we'll have our entire open systems storage farm on one box, with zoning so we can get any disk to any server," he says.

SKILLED FOR SANS?

SAN implementations can be a proving ground for IT employees with systems management backgrounds. Getting on the project team can give your career a boost.

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Skills

- **You must understand the fundamentals of Fibre Channel, RAID and Ethernet/IP networking.** Where do you learn these skills? Bill Voegele, manager of the enterprise storage group at Supervalu Inc., prefers experience. "Training or a certification doesn't hurt a résumé, but there's no substitute for on-the-job training," he says.
- **Backup-and-recovery mediocrities.** Eric Ogilvie, manager of enterprise storage at State Farm, says this is an area in which vendor-sponsored or independent training comes in handy. "That's a mature field, so there are some good courses out there," he says.

Training

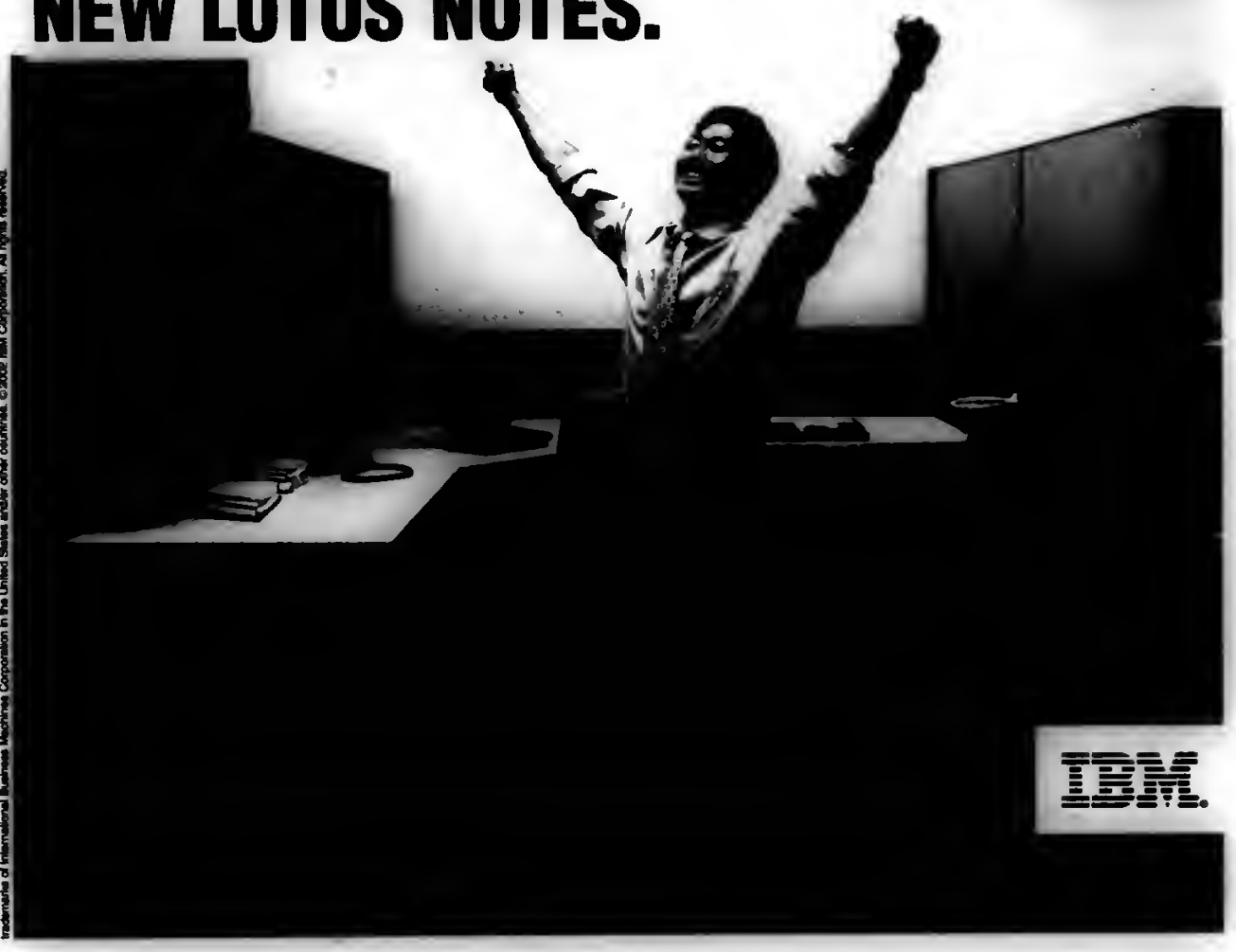
- **The Storage Networking Industry Association (SNIA)** in Mountain View, Calif., recently launched a vendor-independent certification program for storage networking. Currently, the program tests only knowledge of Fibre Channel SANs, but the association says future modules will include network-attached storage, IP storage, backup-and-restore and capacity planning (*www.snia.org*).
- **There are myriad vendor-specific training courses available.** For example, you can find information on training and certification for EMC Corp. products at *www.emc.com/training*.

Salaries

- **Storage engineering manager in Stamford, Conn. Responsibilities:** To manage SAN architectures and implementations. Sun Solaris certification is a must.
  Salary: $100,000 to $120,000
- **Senior systems software developer in Oklahoma City.** This is a systems administration position with responsibility for data storage and configuration control. Candidates need five years' experience with Unix, capacity planning and storage management.
  Salary: $46,500 to $62,000

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The Next Chapter

Predictions: Data storage will be the focus of more lawsuits and scandals. But pundits disagree about whether disks or tapes are a dying breed.

■ LAWSUITS, SCANDALS AHEAD

We're on the cusp of a wave of increased storage awareness and scandals, similar to that which accompanied Upton Sinclair's exposé of meatpacking practices in his novel *The Jungle* and Rachel Carson's call to environment arms in *Silent Spring*. Storage behavior will be a major point of litigation in the information age.

■ *Thornton May, futurist, Biddeford, Maine*

■ WANTED: STORAGE SLEUTHS

Interpreting stored data will be the biggest law enforcement problem over the next 10 years. Expect to see almost any common artifact or construction material potentially storing data.

I anticipate a new profession of forensic data miners who will have to ascertain whether or not something has data encoded in it, what the "pattern" or syntactic encoding is and, on top of that, deal with any encryption mechanism. Without the syntactic and cryptographic Rosetta stones, any data looks like white noise.

■ *David Holtzman, editor in chief of the privacy/security forum GlobalPOV.com*

■ TAPES ARE DYING

By 2007, the use of tapes will be dead for backup purposes. People will back up to disk instead and replicate over the Internet instead of sending tapes off-site.

■ *Scott Erno, director of product and services management at Exodus, a service of Cable & Wireless USA Inc.*

■ DISKS ARE DYING

Disks will become obsolete, being replaced by RAM, and will only be used for backups in large data centers. My guess is that RAM will begin to replace disks in five years or less. (But history suggests it will take 10 years before disks are rare, and 20 for them to disappear entirely.)

At the same time, backups will become a huge headache, and new techniques will be developed to deal with them. It will become common to store files across the Internet, either keeping everything on a remote server or using replication to make the data available locally. As a side effect, encrypted storage will also become the norm.

■ *Geoff Kuenning, assistant professor of computer science, Harvey Mudd College, Claremont, Calif.*

■ LONG LIVE TAPE!

Quite frankly, disk is nothing more than cache for tape. The future is tape.

■ *Pat Martin, chairman, president and CEO of Storage Technology Corp., Louisville, Colo.*

■ PRODUCTIVITY BOOSTERS

By 2004, storage administrator productivity will be 50 times what it is today, while disk utilization increases by a factor of 5.

The disappointing state of today's storage management toolbox, combined with inefficient storage architectures, limits the amount of storage one administrator can handle to just 5TB — if they're lucky. But automated provisioning tools emerging in the next 12 to 18 months will consolidate administratioo of multiple vendors' gear into one toolbox.

Meanwhile, multiprotocol storage routers will deliver diverse NAS, SAN and iSCSI protocols from a single high-utilization infrastructure.

The net result? Tomorrow's administrator will be able to manage 250TB of disk — at 75% utilization levels that seem insane by today's standards.

■ *Galen Schreck, analyst, Forrester Research Inc., Cambridge, Mass.*

■ TERABYTE HARD DRIVES

The 3.5-in. magnetic hard drive, using IBM's antiferromagnetic-coupled recording technology, will continue to be the leading data storage medium through 2005. By the middle of this decade, a new magnetic recording technology known as perpendicular recording will give 3.5-in. hard drives a capacity of at least 1TB.

■ *Michael Katz, managing director of PricewaterhouseCoopers' Global Technology Centre, Menlo Park, Calif.*

■ CONTENT-BASED SEARCHING

Storage will continue to climb higher on the IT value chain by adding increasingly intelligent features, such as content-based searching. Such a system would enable you to find the data you want directly — even if your system holds billions of files — without requiring that you already know its name or location.

■ *Jai Menon, IBM Fellow, IBM's Almaden Research Center, San Jose*

■ ONE-STOP SHOPPING

Despite standards that are emerging to encourage interoperability, single-vendor SANs will continue to dominate the landscape, largely because enterprises will see little immediate payback in upgrading or replacing their existing infrastructure.

■ *Michael Katz, Pricewaterhouse-Coopers*

■ STORAGE OUTSOURCING

As the price for large networking pipes drops, companies will off-load backup and recovery to an outside organization the way they outsource paycheck printing today. Off-site tape storage companies will offer this service or see their business eroded by backup and recovery managed services.

■ *Marc Duvoisin, director of enterprise services, Dimension Data Holdings PLC, Atlanta office*

MORE PREDICTIONS

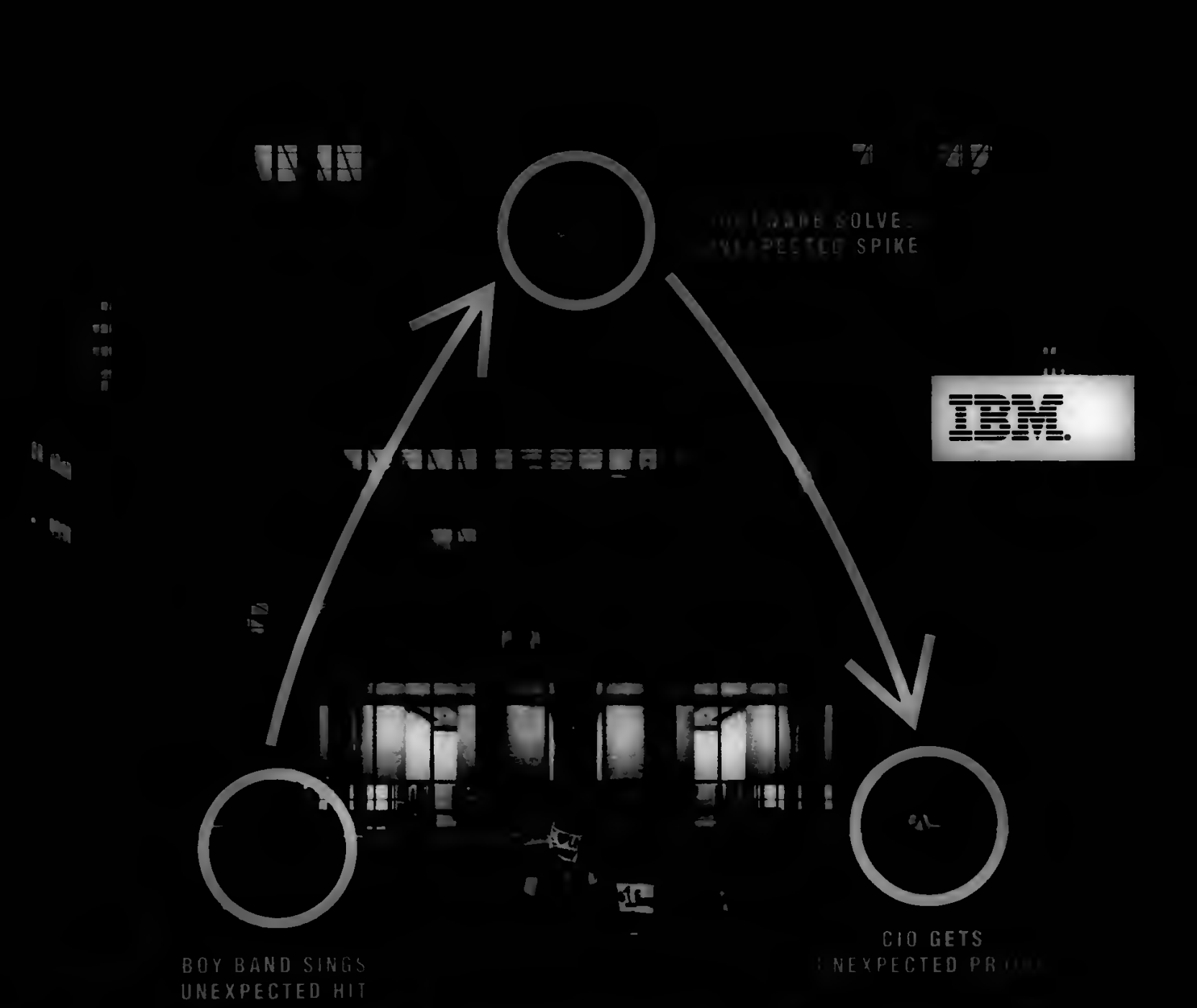
The terms *SAN* and *NAS* will become meaningless, and regulations will require more archiving. Read more prognostications on our Web site:

QuickLink: 33170
www.computerworld.com

Cold Storage



This is a design mock-up of the Ice Cube from IBM Research, which is developing a modular data storage system that will automatically accommodate additional capacity, swings in traffic and device failures – without intervention from a systems administrator. Each module contains 12 disk drives, a processor and a high-performance eight-port network switch. The modules communicate with each other via wireless "couplers" on each of their faces. An Ice Cube system measuring only 2 ft. tall would have a raw data storage capacity of 28,000GB. Working prototypes of the Ice Cube software and hardware are currently being developed.



Tivoli software

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Powerhouse Programmer/Analyst

With a minimum of 2 years Powerhouse experience to design, program & test customer modifications to our Software applications. Must have extensive experience with Powerhouse QUICK, QUIZ and QTP. Ability to work with minimum supervision & interface closely with customers. Experience with Import/Export Software desirable. Bachelor's degree in Computer Science or equivalent work experience. Salary $75K. Send 2 copies of resume to: Job Order #2002-267, PO Box 989, Concord, NH 03302-0989

Software Engineer
Designs, develops & implements soft. systems using IBM mainframes & related software. Must have Bachelors in comp sci, comp appl., math, physics, or eng. plus two yr. exp. as soft. eng. or as a comp prof. as well as one yr of prof exp w/ Unix, VAX/VMS, RMS desw, COBOL, JCL & IBM 3090 mainframe. $65,000/yr., F/T, hrs vary. Send resumes to Armstrong City Team PA CareerLink., Attn: Mgr., 1270 N Water St., PO Box 759, Kittanning, PA 16201-0759 Reference Job Order # WEB 279733.

Controller- Interwise, Inc. has immediate careers opportunities for talented people with appropriate experience to work in our Boston office. Financial Controller North America. Requires B.A./B.S. in Bus. Admin or Accounting, and 5-7 years experience in the Accounting /Auditing field. Send resume to: Interwise, 2334 Walsh Ave., Santa Clara, CA 95051, attn: HR; or fax to 408-748-7818.

UNIX Administrator: Seven Info Links, Inc. two of the fastest growing IT service companies requires as UNIX Administrator to provide all UNIX administration tasks including UNIX scripting, TCP/IP network protocols, and maintaining of Sun/Solaris, Ultra enterprise servers, SAP ERP and near dimension servers. Needs a Masters in CS or any related degree combined with 1 + years experience or Bachelors with 4 years experience as a software engineer. Please send resumes to: Seven Info Links, Inc., Human Resources 9801 Meadowglen Lane, Suite #183, Houston, TX 77042.

Prog/Analysts to analyze, design, maintain web appls using C, C++, Java, HTML etc. design/develop custom appls in a client server environment using Oracle PL/SQL. Dev 2000 under Windows NT UNIX OS provide on site maintenance support to clients such as debugging, modifications, fine tuning and code optimization. Require BS or foreign equiv with conc. or CS or Engg (any branch) & 2 yrs exp in IT. High salaries, F/T. Travel involved. Apply to: HR, Smartsoft International Inc. 4898, South Old Peachtree Rd, Norcross, GA 30071

Comp. Sys Engr-Develop and design software applications for business systems utilizing VB, Oracle 7.3, APACHE and Web Logic Servers. F/T, Min 2/yrs exp. In job offered or 2/yrs exp. relat position with same duties and A.S. in Math, Physics, CIS or relat field. Exp. ref. required. Contact: Azure Systems, 1983 Lake Shadow Way, Suwanee, GA 30024.

Computers-Sr Technical Architects, Project Mgrs. needed. Seeking qual. cand. possessing MS/BS or equiv. and/or rel. work exp. Perl of the exp must include 2 yrs. working with Java, XML and GainERP Work with 3 of the following: Java, XML, GainERP, Bean OpenWorld, VB. Integration exp. with GainERP is preferred. Must be willing to travel as req'd. Fwd resume & ref. to: e-Emphasys Tech., Attn: HR, 218 E. Chatham St., #102, Cary, NC 27511

Database/Web Engineer—exp in web server based applic. dsgn, dvlpmt, troubleshoot, fine tuning & admin. Familiar w/GUI interface, trilogy object modeling, EJB, shell scripting, UML, J2EE, ODA/OOD, C++, Java, Oracle 8i & UDB dBase webSphere & pplic. Familiar w/project mgmt for fin'l & HR industry & CISCO router. BSc/BEng w/2 yrs exp. 40hrs 8a-5p. Send resume to Ms Malti, Nextech Group, Inc, 15 New Dover Ave, Colonia, NJ 07067.

Manager
Amazon Technologies Co., a leading developer of sophisticated as-traffic management systems, seeks a Business & Product Development Manager. Must have MS in Engineering or related field and 4 yrs exp in software engineering. Experience w/real time systems & distributed tech., IEEE/EIA 12207 and Mil STD-498 standards, and Portuguese fluency are required. To apply, send resume and cover letter to: Attn: Felipe Rochlewau, Amazon Tech., 500 West Cummings Pkwy, Suite 5600, Woburn, MA 01801. Must have unrestricted authorization to work in the United States.

Sr. Network Management Software Engineer. Portsmouth, NH. Design, develop & test secure, SSL, web-based user interfaces & services in support of network mngmnt of Company's next generation, protocol agnostic, converged Fibre Channel & Ethernet switch, that is to be deployed within a Storage Area Network (SAN); develop a complete object-oriented framework utilizing backend Linux scripts written in TCL, Perl & BASH or make SNMP requests for dynamic web page creation & display of the mngmnt & configuration data for purposes of switch services such as fault, configuration, accounting, performance & security; work individually, as well as within a team or develop a distributed, high-availability switch framework solution that guarantees an industry standard of continuous 5 nines (99.999%) uptime of the switch & to create, develop database schemas & data models for purposes of design, development & test of standalone SNMP Agents through which the web-based user interfaces & services can expose internal switch services & data. Must be able to utilize XML, DTD, & DOM to represent & access these databases through web enabled services; develop a distributed web-based solution for concurrent mngmnt of multiple, interlinked Sandial switches; Design & develop web pages, interfaces, services & applications utilizing XML, DTD, DOM, HTML, HTTP, DHTML, Javascript, TCL & Java for the IIS &/or Apache web servers; design & develop multithreaded (Pthreads) & object-oriented user-interface applications & Linux based web-page interfaces & services; participate in the data modeling of the switch services mngmnt data for use in developing a DMTF/CIM object-oriented mngmnt database scheme & framework consisting of a CIM/DM process that translates XML over HTML/HTTP requests into switch configuration changes. Develop XML, DTD & DOM documents, data models & database schemas in support of this data modeling. Supvr: Manager, Software Design. Supervise 0 staff. Salary $75,000. 40 hrs/wk, 8:00 a.m.-4:00 p.m. Educ: 3 or 4 yr undergrad degree or foreign equiv in Computer Science, Engineering, Electronics or a related technical field. Exp: 2 yrs in job offered or 2 yrs in position developing networking &/or enterprise network mngmnt solutions; 2 yrs of exp with the following: Developing database schemas & data models; IIS, TCL/Httpd &/or Apache web servers. Development of multithreaded, object oriented applications; Development of web-page interfaces & services; DTD & DOM; Development & deployment of software applications for use in a SAN environment, & at least three of the following technologies: TCL, Perl, XML, DHTML, HTML, HTTP, Java, JavaScript, SSL. Applicants must send two (2) copies of their resume/letters of application to Job Order #2003-001, P.O. Box 989, Concord, NH 03302-0989.

Prog/Analysts to design, develop and implement appls using

---COBOL, CICS, DB2, JCL, Oracle, Pro*C, C on Windows, UNIX & IBM Mainframes, perform DBA duties using Sybase Replication Server to perform admin on UNISYS A-Series environments,

---C, C++, VB, ASP, COM, DCOM, CORBA, Oracle and SQL Server on Windows and UNIX OS.

conduct user requirement/feasibility studies, systems analysis, maintenance, documentation, support, unit/system testing and debugging. Require BS or foreign equiv in CS/Engg (any branch) and 2 yrs exp in IT. High salary. 0% Some travel required. Resumes to: Salem Associates, Inc. 405, 6th Ave, Ste 102, Des Moines, IA 50309

SAP Basis Admin: Samsung SDS sks SAP Basis Admin w/ knwldg of SAP R/3, CRM, ESS, Portals, ERPro, ITS & Busi. Connector. Degr SAP 4.6B sys arch & BW sys under Oracle on Unix under sup of mgr. Req: BS in CS & 2 yrs exp. Send res to: Mr. SA Park at Samsung SDS 18 Corp. Pl. S, Piscataway, NJ 08854

Multiple openings for software engineers/consultants, programmer analysts, project engineers/managers, program mgr (Biz Dev). Some positions req Bachelor (or equiv.) while others req Masters (or equiv.) in CS, Engg, Math, Bus Admin or related field. We will accept the foreign edu. equiv. &/or its equiv. in edu. & exp. Exp. req. will depend on position. Mail resumes to HR, Harvard Soft, 605 Cardinal Lane, Tyngsboro, MA 01879.

Sr. S/ware Engr wanted by a s/ware develp Co. in Sacramento, CA. Will develp and customize Unify s/ware prod. for far eastern Pacific-Rim mkts. Must have Bach deg in CS or Comp. Engr with fluency in spoken and written Japanese with understanding of Japanese & eastern Asian lang. character code sets. Mail resume to: HR, Unify Corporation, 201 Arena Blvd., Suite 100, Sacramento, CA 95834

Software Test Engineer, Senior TeamShare, Inc. is seeking Senior Software Test Engineer for its Colorado Springs location. Position involves design, development, and testing of applications that run on Windows platform and access relational database management systems. Position requires Master's in computer science or related field and exp years of development experience in Windows accessing RDBMS using Winrunner, HTML and SQL. Apply by surface mail only: Attn: Human Resources Ref #0062002, TeamShare Inc., 1975 Research Parkway, Ste 200, Colorado Springs, CO 80920

Systems Analyst/Web Designer 8a-6p, 40 hrs/wk. Analyze reqmts, recommend dsgn, organize/categorize info, dvlp navigational structures, analyzing large sets of data & advanced site prgmg, work w/ web/internet prgmg & digital imaging. Req: Bach or equiv in Comp Sci or closely related. Resume to: Madan L. Dhamija, Netcamp, 250 Amber Light Ct. Henderson, NV 89074

MANAGER, Software Research & Development sought by NJ based Securities Dealer. Must possess Master's Degree or equivalent in Computer Science or directly related field and 4 years exp. in Software/systems development/design/research. Respond to: Human Resources Department, 810TJ0MC, Knight Trading Group, Inc., 525 Washington Blvd., Jersey City, NJ 07310.

Systems & Requirements Engineer wanted to analyze, design, develop and support systems and business support systems. Bachelor's degree or equivalent in a Computer related field and a minimum of 4 years experience in software development. Must also have at least 1 year of experience in TIBCO Rendezvous, TIBCO Integration Manager and TIBCO Message Broker. Please e-mail resumes to: Rebecca.guatemala@radiancy.com (subject: Code 311)

Database/Web Engineer—exp in web server based applic. dsgn, dvlpmt, troubleshoot, fine tuning & admin. Familiar w/GUI interface, trilogy object modeling, EJB & CMM Level 2 security expertise, UML, J2EE dsgn sales commission retail distribution using Java, Oracle & UDB dBase webSphere applic. Familiar w/IBM Websphere version 4.x for insurance, fin'l & HR industry. BSc/BEng w/5 yrs exp or MSc/MEng, 40hrs 8a-5p. Send resume to Mr. Raj Bhatia, KR Info Technology, Inc. 215-18 48th Ave, Bayside, NY 11364

Software Engineer. A supplier of world class circuits to world-known PC manufacturers is seeking a Software Engineer who will be responsible for developing drivers under Win 98/ME/2000 that will handle PnP messages & pass WHQL tests. Req'd: Master's degree in Engineering, Computer Science, Information Systems or related w/1 yr exp in the job offered or an Application Software Developer. Exp w/Win OS architecture, MS SQL Server 8.5, Visual BASIC & C/C++. Send resume to: Standard Microsystems Corp, 11000 N Mopac Exp. Stonelake Bldg 6, Austin, TX 78759, Attn: Rick Karl.

TAX APPRAISAL COLLECTION SOFTWARE PROJECT MANAGER wanted by law firm in Houston, TX. Must have degree & tax appraisal collection SW development exp. Respond by resume only to: Ms. Veronica Brown, Linebarger Goggan Blair Pena & Sampson LLP, 911 Central Parkway N., Ste 200, San Antonio, TX 78232.

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Anacom has openings for IT professionals (BAW, project engineers, programmer/system analysts). Candidates must have BS/MS. One-year exp. is a minimum. Skills in areas of C, COBOL, Oracle, SQL, Sybase, DB2, People Soft, SQA, VB are plus. Contact anacon@anacon.com. EOE.

Computer Professionals (multiple) wanted by Bralak Technologies (small but stable). Candidates must have or least BS degree. IT experience in Oracle, Unix, C/C++, SQL, PL/SQL, WebLogic, etc is a plus. Attractive wage with full benefits. Please send resumes to: hr@bralak.com. EOE.

Programmers & Developers:
Design, develop, test and implement specialized applications as per custom specifications in ERWIN, Oracle Web Portal, Data Junction, Data Warehousing, Datamarts and Cognos BI. Prevailing wage/benefits. Send resume to Mr. Chinna Rao, Bhargav Computer Consulting USA, Inc., 42 Read's Way, New Castle Corporate Commons, New Castle, DE 19720. EOE.

Portsmouth-based internet software co. seeks Principal Software QA Engineer to ensure engineering integrity of software platforms/applications, including database administration/testing, design/implementation of software testing plans, and test suite automation for Java and XML software tools. Must have Bach. in Comp. Sci., Elec. Eng. or equiv., 3 yrs exp. in software development or quality assurance, and knowledge of: Java, Javascript; JBuilder; JDBC; testing of graphical user interfaces, relational database systems such as Sybase, Oracle, DB2, and MS-SQL Server; HTML, XML, and Windows. Salary $82,700-$90,000/yr. Submit 2 resumes to: Job Order #2002-243, PO Box 989, Concord, NH 03302-0989.

SYSTEMS ANALYSTS Systems On Line Inc., Houston based company requires Systems Analysts to research, analyze, design and develop operational procedures to automate processing and to develop new systems to improve production. Knowledge of SAP, Oracle, and other business related software is essential. Needs a Masters in Engineering/CS or in any related field combined with 1 years relevant experience in designing and developing computer software systems OR Bachelor's combined with 5 years relevant experience considered. Please send resumes to Mr. Srinivas Sonti, Recruiter, Systems On Line, Inc., 7231 Brantford Park Ln, Richmond, TX 77469.

Programmer/Analyst (Somerset, NJ) Plan, develop, test & document com-puter software using COBOL II, DB2, VSAM, IMS DB/DC, MVS, FILE-AID, ENDEAVOR, PANVALET, VIASOFT, Insight, Platinum, CA-ProEdit & JCL skills. 37.5 hrs/wk, 9am-5pm, $44/hr. 2 yrs exp req'd. Bachelor's degree/major field of study: Comp Sci, Comp Engg or Comm Engg. Send resume to: United Logic, Inc. 1075 Easton Ave. Tower 2, Suite 9, Somerset, NJ 08873.

Senior Software Engineer – analyze, design, develop, test & implement eGovernment applications & products using knowledge of & experience w/ Oracle & MS Acces RDBMS, Unix shell script, Unix utilities (lex, yacc, awk), Java, JavaScripts, Java Swing, JDBC, DCOM, Esterel, MFC, Visual C++ & C on Unix (Sun Solaris) & Windows 2000/NT, develop object model/use cases & class diagrams in UML, develop IVR applications using VoiceXML, manage on-site & remote development teams; Requires: Web & Application server use & maintenance exp.; BS (or MS) in computer science or information systems + 7 YR related exp. (5 YR w/ MS) Interested candidates e.mail resumes to khoehling@ncuse.com.

Sensa has openings for IT professionals. BS/MS is must. Skills in SAP, Baan, Peoplesoft, Oracle Apps, Sybase, AS/400, VB, PB, JAVA, JavaScript, PERL, Cat, HTML, XML, C, C++, OOPS, Web logic & Lotus Notes preferred. Also want Marketing Executive, resume@sarasamerica.com

Extraware, a service Co. for global agriculture trade markets is looking for Business/Sys. Analysts & S/W Eng. Min. BS with 1-yr exp. required. Key skills s/w design, dev. and testing, proj mgt., OO prog., java, and xml. Send resumes to careers@extraware.com. EOE

Programmer/Analyst / Software Art Corp., a software-consulting firm requires software professionals with demonstrated hands-on experience in the following: Unix System Admins Sun/HP Client Server: MS VB .NET, ASP .NET C#/C++/Oracle/Sybase/Windows/Unix DBA: Sybase/SQL Server Internet Computing: JAVA/CORBA /XML, JAVA/Websphere/Weblogic QA Testers: Manual/Automated, JD Edwards, SAS Programmers Send resume to: Software Art Corporation 2304 Brunswick Ave, Lawrenceville NJ 08648 nicky@softwareart.com

Computer-Sr. Software Engineers needed Zephyr Assoc. a Zephyr Cove based NV company is seeking qual candidates possessing MS or equiv and/or relevant work exp. Exp must include 1 yr working with C++, Win32 API & DBMS. Develop & design investment analysis software applications for institutional investment industry. Mail resume & references to Zephyr Assoc., Attn: HR, P.O. Box 12368, Zephyr Cove, NV 89448.

Komputer Plus Peripherals, Inc. in Houston, TX has 6 positions avail for Computer Support Specialists to provide technical assistance/support, resolve technical difficulties by analyzing/developing applications using Rational Rose, VisualAge for Java, Websphere application server, NT/SQL Server, System Development Life Cycle, Structured Analysis Methods, Entity Relationship Diagrams, Process Decomposition, Data Flow Diagrams, C++, NT, UNIX, and VMS OS. Req. Bachelor's degree in comp sc/eng, info sys or rel field and 18 mos of tech support and/or systems admin and/or programming exp. Resumes to E. Pascual, 11750 Wilcrest Dr., Houston, TX 77099

Software Engineer Work Sched 8:00AM-5:00PM 40 hrs/wk. $83,387.20 P/A. Analyze, program, design, modify, code, test & implement multi-tiered client server & web software to access database in Windows, DOS, UNIX & mainframe environments. Use artificial intelligence theory & Object Oriented ("OO") OOA (Analysis), OOP (Programming), OOD (Development), & OO (Concept) methodologies & algorithms to analyze manufacturing process requirements & design applications structures. Program & develop software using Java, JDK, AWT, Applet, Swing, Java beans, J2EE, JDBC, RMI, Multi-thread, Serverlet, Websphere, Kawa & VisualAge in Windows, DOS, UNIX & distributed multi-tiered Client/Server environment. Also apply HTML, XML, JavaScript & SQL & JProbe. Develop artificial intelligence theory & find concrete business solutions for transaction over different technical domains. Research & develop applications to facilitate total quality management, scheduling optimization, plant floor process controls & real-time monitoring & feedback to reduce vehicle production times & lower costs, including during manufacturing process activities. Master: Computer Science &/or Computer Science & Engineering. Six mths. exp. in Job or Related Occupation (s) of Engineer or Research Assistant. Six months of Related Occupation experience must include using artificial intelligence theory & OOA, OOP, & OOD methodologies to design prototype applications systems, which may be concurrent with Related Occupation experience. Employer Paid Ad. Send resume to MDCD, P.O. Box 11170, Detroit, MI 48232. Ref. No. 202186

Special Projects Director for company located in Grand Prairie, Texas. 40-hour week, 8a-5p. Masters or foreign degree equivalent to Computer Science and 1 year experience as a Systems Analyst. Supervise 1 employee. Responsible for IT project management including planning, designing and implementing technology solutions in order to reduce production costs and increase efficiency. Fax resume to Human Resources 972-642-9987

Software Engineers. Exciting opportunity for experienced Software Engineers. Multiple job openings. Send resume to: Hyland Software, Inc. 28500 Clemens Rd., Westlake, OH 44145. Attention HR Manager. Req# SE-3-IGS. or on line to debbiac@onbase.com w/ Req#SE-3-IGS in subject line.

KBTS Tech is looking for System /Quality Analysts. Install and configure Sun Solaris 8/2.6 on Sun E3500, E450 Enterprise Servers & Sparc workstations. Also configure I/O devices (Ethernet, SCSI and tape drives) and other peripherals. Minimum BS. Apply at info@kbtstech.com. EOE

Synergy has openings for IT professionals or engineers. Qualified applicants must have BS/MS with 1-year experience. Strong background in TCP/IP Suite, Unix, DB2, Oracle, VB, SQL, IIS, Window NT and XML is plus. Send resumes to hr@synergycom.com. Travel is required. EOE

Senior Business Analysts: Oracle Apps. 11i, PeopleSoft 8.0, Apps DBAs, Oracle RDBMS 7.3, Oracle Apps. 11i upgrade, cloning & migration, ERWIN, SQL Server RDBMS, SQL Server 2000/ 7.0, Oracle Developer 2000/6i, Discoverer 4.1, OFA Express Server, Omni backup HP Open View 4.1/Measure Ware Agent, Veritas Backup Exec 7.0 Operating systems Solaris 2.7/8, HP-UX 11/11i, Windows NT/2000 platforms. Senior ERP Programmer Analysts: Oracle PL/SQL, Developer 2000/6i, Designer 2000, Oracle Apps 11i (modules-GL, AP, AR, FA, PO, INV, OE/OM, HRMS, Service, OPM's Manufacturing, inventory, OPM's Multibatch Management, C, C++, Java 2, Pro*C, Visual Gen 2.2, Functional Experience. Senior Programmer/Analysts: Oracle PL/SQL, Oracle 9i/9AS, Developer 2000/6i, CRM Programmer/Analysts: Siebel suite incl Communications 2000, Call Center, Energy 100, Tools 7.0, Oracle CRM 31/11i; Senior DBAs: Sybase 12.5, Oracle database 9i. Senior Network Engineers/Certified Microsoft Trainers: MCSE, MCT & Cisco certifications. Prevailing wage /benefits. Consulting positions requiring travel. To apply, send resume identifying position(s) interested to: HR, BPO Systems, 501 Silverside Road, Suite 53, Wilmington, DE 19809. US Workers Only. EOE

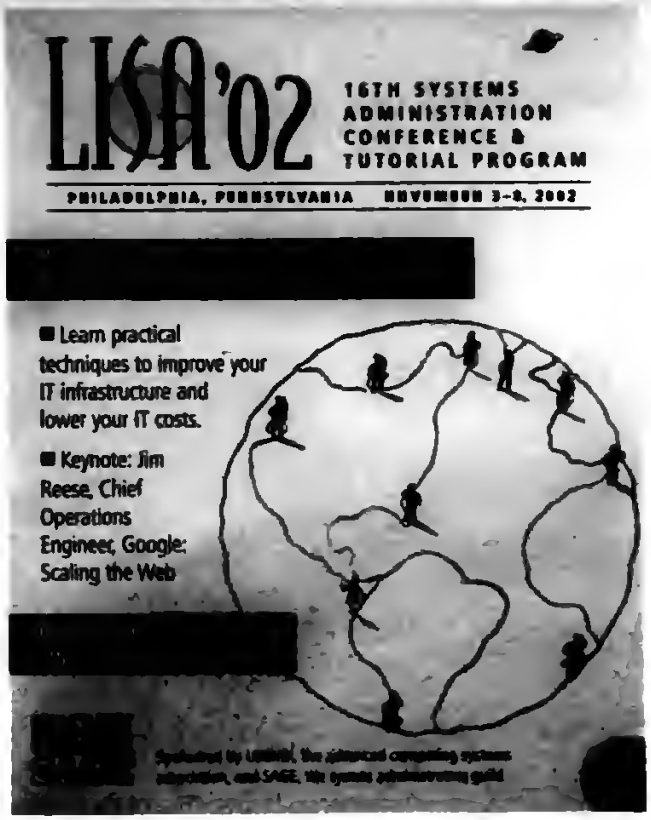
DIRECTOR, INFORMATION AND TECHNOLOGY COUNTY OF MERCED

The County of Merced, located in Central California, seeks a sophisticated, experienced Director, Information and Technology to manage a budget of $7.4 million and staff of 45.

Responsible for the business operation and management of the countywide mainframe computer, local and wide area networks, telecommunication systems and emergency 9-1-1 coordination. In addition to strong managerial and analytical skills, candidates should have broad and extensive experience in the management of computer information and telecommunications systems, including a minimum of 3 years experience at a senior level or full supervisory capacity. Equivalent to graduation from a four-year college with major work in a related field is required (Master's degree desirable). Salary to $101,837 per year plus excellent benefits.

To apply, send cover letter, indication of current salary, three work-related references and resume that reflects months and years of beginning/ending dates of positions held. Forward your materials by November 4, 2002 to Tan Black-Brann at: CSAC HR ADVISORY SERVICES 241 Lathrop Way, Sacramento, CA 95815. Tel: (916) 263-1401, Fax: (916) 5 4 1 - 7 2 0 5 . E m a i l : r a b u m a 4 @ c p a . c a . g o v www.cpa.ca.gov/shannon

Programmer Analyst Marsh, NY- Software/Sys. Dev firm seeks qualified indiv to analyze, develop, revise, test, & fine-tune multimedia presentations, under supervision, for clients. Req'd: BS in CompSci & 1 yr exp. in the job offered. Must have exp in Lingo, SQL & Install Script. Must know Macromedia Director. Software Pls send res for Cynthia Camuso, Interactive Edge, Inc. 19 W. 16th Street, 5th Fl., NY, NY 10011



Elogex has an opening for a Software Engineer (Senior). The qualified candidate will coordinate development and maintenance of computer systems utilizing various database servers and applications. Responsibilities include overseeing analysts of business requirements and development of detailed specifications for new and existing applications of the Elogex Network, applying information engineering and structured systems development languages, analyzing existing software, documentation and current processes as well as overseeing design, testing, installation and documentation of new and existing programs. Will be responsible for maintaining existing programs and working with end-users, coordinating user training, problem resolution and troubleshooting. Minimum requirements are a B.S. in Computer Science, 7 years of experience in software development and knowledge of Java design/development, HTML, JSPs, SQL, interface design development and XML/DTD design development. Please submit your resume to Elogex, HR, 212 South Tryon Street, Charlotte, NC 28281

Several computer related positions available for international airline telecom and information services company. Degree, technical skills & experience vary per position. Send resume to Natasha Lyttle, SITA INC, 3100 Cumberland Blvd., Ste 200, Atlanta, GA 30339. SITA INC is an Equal Opportunity Employer

Business Analyst
Provide technical assistance to client's at remote locations. Develop customized IT solutions based on product knowledge and capacity and a client's systems requirements. Must have Bachelors Degree in Information Systems or CS & 6 mos. exp. or 6 mos. exp. in a related position available to use Unix, AS/400, Windows, C++, Cobol, Code Modification and Conflict Resolution.

40.0 hrs./wk. 8:00 AM – 6:00 PM $57, 450/Yr

Applicants send cover letter and resume to:
McCamish Systems LLC
6425 Powers Ferry Road
3rd Floor
Atlanta, GA 30339
Attn: Donna Perlmutter

Cedar Enterprise Solutions, Inc., a software consulting and services organization has an opening for a Systems Analyst. The ideal candidate will analyze user requirements and design custom views for users, will design, develop and maintain interfaces, create remote databases, maintain servers and systems reports, and support existing systems. Responsibilities will also encompass development and implementation of new and existing applications and data conversion processes. Minimum requirements are a Bachelors Degree in Computer Science and 2 years of experience in systems analysis, program design and development, applications implementation and support or 4 years of professional experience in systems analysis, program design and development, applications implementation and support. Please submit your resume to Cedar Enterprise Solutions, Inc./HR, 100 East Pratt Street, Baltimore, MD 21202

VegaStream, Inc., located in Dublin is seeking F/T exptl Manager of Product Support to research, design, and developing of computer software systems, in conjunction with hardware product development. Analyze software requirements to determine feasibility of design within time and cost constraints. Consult with hardware engineers and other engineering staff to evaluate interface between hardware and software, and operational and performance requirements of overall system. Formulate and design software system, using scientific analysis and mathematical models to predict and measure outcome and consequences of design. Bachelor's degree in Computer Science, competitive salary. Fax resume to Gina (561) 995-6027

System Analyst wanted for West Lebanon, NH company to perform day to day mgmt. of web based & mobile technologies, projects involving extensive client interaction for system reqts. analysis design & architecture of solutions, prototype develop. identif. & develop of middleware components such as COM, JavaBeans, EJB, database design, inter-team mgmt., project mgmt., using tools such as Visio, IBM Visual Age for Java, Allaire JRun, MOSeries (XML Messaging), Personal Rose 99, RDBMS such as Oracle 8.1, SQL Server MS-Project, resource planning & mgmt., methodology identif., eval. & adoption, process definition & implementation, post implementation support. Resp. for mgmt. of projects, defining methodology & processes, managing developers & strategic planning. Must have Bach. deg. in Comp. Sci., Electronic Eng. or Math. & 2 yrs. exper. 40.0/wk. $71,000/yr. Send 2 resumes to Job Order #2002-109, PO Box 989, Concord, NH 03302-0989

Business Objects has an opening for the position to VP, Latin Americas Sales to be based out of our Miami, FL office. The VP, Latin American Sales has an overall responsibility for developing marketing strategy and business plan for the Latin America region. Developing and managing the direct sales, channels, alliances, and professional services for the region. Creating and fostering partnerships directly with key influencers of local markets, including major consulting firms. Generating sales revenue and managing P&L. Developing the main production sales markets, improving delivery and reseller partnerships, and regional support capability related to implement service software solutions. Identifying business opportunities to penetrate market, including possible acquisition targets. Travel approx. 60% to interact directly and build relationships with staff, partners, customers and vendors to all. The position requires a min. of a Bachelor's degree or equivalent in Marketing, Finance, BA or related field. Will accept 2 years of related experience an equivalent to Bachelor's degree). Eight years experience in Sales/Marketing Mgmt. Experience must include managing acquisitions/due diligence. 5 years in software industry sales, including enterprise software. 2 years developing business/mktg. plans for the Latin America region. To apply for a position visit our website to www.businessobjects.com/careers or forward your resume (ref CW1002) to: Business Objects Americas, Attn: Staffing, 3030 Orchard Pkwy, San Jose, CA 95134 EOE

PCTEL, Inc. is seeking a Software Engineer who will be responsible for design & development of end-to-end enterprise solutions for wide-area and short-range RF wireless networks. In addition to software design and development duties, you will be responsible for project coordination and tools evaluation of our development teams in Belgrade, Serbia. You must be able to travel to Eastern Europe approx. 30% of the year. Requires a Bachelor of Science in Engineering or related field and a minimum of two years experience in object oriented design and development including distributed Java technology (servlets, JSP sockets, threads, EJB, XML, Swing, applets) Microsoft (C++, Visual Basic, ASP Active, COM/COM+/DCOM) Understanding of Microsoft .NET platform (C# ASP.NET, SOAP) User interface design & development (HTML/DHTML, Java Script, Photoshop) At least one year experience managing a team of developers and coordinating outside product development efforts in Eastern Europe. Candidate must be legally eligible to work in the United States for any employer.

For immediate consideration, please send your resume directly to: jobs@pctel.com Or Mail directly to ATTN: HR Dept Job: PCTEL, Inc. 8725 W Higgins Rd, suite 400, Chicago, IL 60631

SENIOR SOFTWARE ENGINEER to design, develop, implement, test, maintain and support complex software for various business applications using C++, PL/SQL, HTML, Oracle, Sybase, MS Access, Visual Basic, JavaScript, Developer 2000, COBOL, DB2, VSAM, MVS, JCL, ColdFusion and Vignette on UNIX and Windows platforms. Mentor junior programmers and engineers. Require B.S. degree in Computer Science, an Engineering discipline, or a closely related field with five years of progressively responsible experience in the job offered or as a Programmer/Analyst or Programmer Extensive travel on assignment to various client sites within the U.S. is required. Competitive salary offered. Apply by resume to Ram Kandimalla, Everest Computers Inc., 800 Old Roswell Lakes Parkway, Suite 300, Roswell, GA 30076. Attn: Job RA.

PCTEL, Inc. is seeking a Computer Software Engineer to research and analyze highly sophisticated applications for business users. Candidate will be responsible for all phases of software development including architecture, design, development, testing and debugging state-of-the-art software applications. As a member of a development team you will develop a multi-protocol interface for IP networks, using C/C++, JAVA, Linux (Unix), SQL, SNMP, TCP/IP and wireless LAN's protocol. Duties involve both changes to existing software and the creation of new software. Responsible for formulating a plan outlining the steps to develop programs using structural analysis and design techniques. Prepare detailed flowcharts and diagrams to illustrate the sequence steps a program must follow and describe the logical operation involved. Requires a Bachelor of Science in Computer Science or its equivalent plus a minimum of two years direct experience in the job offered. Requires travel to Eastern Europe approx. 20% of the year. Candidate must be legally eligible to work in the United States for any employer.

For immediate consideration, please send your resume directly to: jobs@pctel.com Or Mail directly to: ATTN: HR Dept Job: PCTEL, Inc. 8725 W Higgins Rd, suite 400, Chicago, IL 60631

SR. RESEARCH SOFTWARE ENGINEER

Xerox Corporation has an opportunity available for a Senior Research Software Engineer in Webster, NY

Responsibilities will include participating in the research, development & testing of a complete set of analytical measurement techniques (metrics) for quantification of color image quality of printer products at the system level. Will utilize C/C++ to develop & validate image analysis algorithms & implement algorithms. Will design, conduct & analyze psychophysical experiments & collaborate with product teams.

Candidates must have a Ph.D. in Electrical Engineering, Computer Engineering or a related field. Must have coursework or training in writing C/C++ code for image analysis & on algorithm development. Must have demonstrated state-of-the art knowledge in imaging science through publication in professional journals.

Please submit your resume via e-mail to: bdapeal@crt.xerox.com or fax 585.231.5987 Drawing on the diversity of global workforce and offering an equal opportunity to achieve success. EOE M/F/D/V

DATABASE ADMINISTRATOR

Database Administrator to do Logical and physical design of Oracle database, Code test and implement Oracle scripts applying knowledge of Database Management Systems; Calculate optimum values for Oracle data-base parameters; performance tune Oracle databases; Model Oracle database security; manage backup and recovery of Oracle databases, make changes to Oracle database applications using knowledge of Oracle 7.3 C and PL/SQL. Requirements: Bachelor's Degree in Computer Science or related field and two years experience on a database administrator. Expertise in Oracle database administration which includes logical design, physical design, performance tuning, backup and recovery, coding of scripts, knowledge of Oracle 7.3, C and PL/SQL. Salary $65,000 /year. Working Conditions: 8:00 A.M. to 5:00 P.M., 40 hours/week, involves extensive travel and relocation. Apply Site Administrator Greene County Team PA Career Link, 4 West High St., Waynesburg, PA 15370. Job No. WEB268001

Computer Programmer Analyst
AVX Corporation, a worldwide leader in manufacturing passive electronic components and capacitors, has an opening for a Computer Programmer Analyst. Duties are the following: 1. Updates, tests, and implements online programs written in COBOL/CICS. 2. Codes, updates, and tests batch programs written in COBOL/VSAM & COBOL. 3. Codes, updates, tests and implements batch and online programs written in NATURAL/ADABAS. 4. Develops and maintains systems running in MVS/TSO and 5. Generates jobs to run the new programs created. Salary and benefits offered are commensurate with the position. Minimum requirements are a Bachelor's Degree in Computer Science, Mathematics, or Management Information Systems and one year six months experience in the job offered. Work schedule is from 8:30 a.m. to 5:30 p.m. Monday through Friday, 40 hours per week. The position is located in Myrtle Beach, South Carolina. Applicants must send two resumes to the following: AVX Corporation, Human Resources Dept. 15, Computer Programmer Analyst Position, Post Office Box 867, Myrtle Beach, South Carolina 29577. No Phone Calls please.

Exec Search, Inc. a technology consulting firm seeks multiple individuals
for the following positions in our Brookfield, WI office:
- Programmer/Analyst, utilizing Unix/C/C++, ORACLE, JAVA, Visual C++.
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- Software Engineers to design and develop software systems utilizing ORACLE, Developer 2000 (Forms & reports), Designer 2000, and Datawarehousing Tools.

Applicants for the above positions should possess Bachelor's degree or higher in a related discipline, as well as relevant IT experience. Relocation may be necessary depending on the particular employment position.

Apply w/ resume to Exec Search, Inc. C/O ISS, 1300 Bent Creek Blvd, Suite 200, Mechanicsburg, PA 17050

COMPUTERVIT
Developer. Requires a Bachelor's degree (or equivalent foreign education) in computer science and/or engineering and two years of experience in the job offered or in multi process, multi threaded real time server application development. Experience must include developing middleware applications using C++ in a Windows NT environment. Responsible for analyzing, designing, and developing multi threaded real time server applications utilizing C++ in a Windows NT environment. 40 hrs./wk., 8:00-5:00. Apply with resume to Sharon Toles, Delta Technology, Inc., 1001 International Blvd., Dept. 701, Atlanta, GA 30354.

SOFTWARE ENGINEER to design, develop, test, maintain and implement web based application software using Java, Visual Basic, EJB, ASP, Java Scripts, HTML, COBOL, DB2, IMS DB/DC, CICS, MQ Series and ATG Dynamo under Windows NT and UNIX operating systems. Supervise and mentor junior programmers and engineers. Require Bachelor's degree in Computer Science, an Engineering discipline or a closely related field with five years of progressively responsible experience in the job offered or as a Programmer/Analyst or Programmer. Competitive salary offered. Apply by resume to: Frank Beaman, Global Software Development Services, Inc., 10 South Fifth St., Suite 600, Minneapolis, MN 55402. Attn: Job RM.

Senior Business Application Developer Requires a bachelor's degree or equivalent foreign education in computer science or an engineering field and three years of experience in the job offered or three years to experience in business application design, development, installation, and modification in an online environment. All stated experience must involve integrating SAP R/3 modules with optimizing and forecasting software and SAP Business Information Warehouse components; modifying and using Sales and Distribution, Materials Management, and Warehouse Management functions to extend across SAP components; and customizing SAP toolsets within a consumer products environment. 40 hrs./wk. 8:00 a.m. @ 8:00 p.m. Apply with resume to Mr. Kyle Stuehs, The Scotts Company, 14111 Scottslawn Road, Marysville, OH 43041

SOFTWARE ENGINEER

Software engineer to design, develop and test computer programs for business applications; analyze software requirements to determine feasibility of design; direct software system testing procedures using expertise in Visual Age, CORBA, Oracle and Rational Rose. Requirements: Bachelor's Degree or equivalent in Computer Science or related field and two years experience as a software engineer or computer programmer; knowledge of Visual Age, CORBA, Oracle and Rational Rose. Salary: $66,000 /year. Working Conditions: 8:00 A.M. to 5:00 P.M., 40 hours/week, involves extensive travel and frequent relocation. Apply Site Administrator, Greene County Team PA CareerLink, 4 West High Street, Waynesburg, PA 15370-1324. Job No. WEB2981010.

SENIOR SOFTWARE ENGINEER to lead a team in the design, development, testing and implementation of business and financial application software and complex databases using DB2, COBOL, Platinum Tools, Endevor, Xpeditor, JCL, VSAM, CICS, TSO, File-Aid, CSP, FCP, Spufi, QMF, IDMS and Telon. Supervise and mentor junior programmers. Tune databases for optimum performance. Coordinate technical support with offshore team on a 24/7 basis. Require: Bachelor's degree in Business Administration, Economics, Computer Science, or a closely related field with five years to progressively responsible experience in the job offered or as a Programmer/Analyst or Programmer. Extensive travel on assignments to various client sites within the U.S. is required. Competitive salary offered. Apply by resume to: Sophia Mackenzie, Software Paradigms International, Inc., 3901 Roswell Road, Suite 134, Marietta, GA 30062. Attn: Job PS

SOFTWARE ENGINEER

Software engineer to design, develop and test computer programs for business applications; analyze software requirements to determine feasibility of design; direct software system testing procedures using expertise in Java, Oracle, C, C++ and XML. Requirements: Bachelor's Degree or equivalent in Computer Science or related field and two years experience as a software engineer or computer programmer; knowledge of Java, Oracle, C, C++ and XML. Salary: $66,000/year. Working Conditions: 8:00 A.M. to 5:00 P.M., 40 hours/week, involves extensive travel and frequent relocation. Apply Manager, Westmoreland County CareerLink, 300 East Hills St., Youngwood, PA 15697. Job No. WEB2981996

SOFTWARE ENGINEER

Software engineer to design, develop and test computer programs for business applications; analyze software requirements; direct software system testing procedures using expertise in SeeBeyond, Oracle 8i and HIPAA. Requirements: Bachelor's Degree or equivalent in Computer Science or related field and two years experience or a software engineer or computer programmer; knowledge of SeeBeyond, Oracle 8i and HIPAA. Salary: $65,000/year. Working Conditions: 8:00 A.M. to 5:00 P.M., 40 hours/week, involves extensive travel and frequent relocation. Apply Fayette County Team PA CareerLink, Attn: JS Supervisor, 32 Iowa Street, Uniontown, PA 15401-3513. Job No. WEB2981992

PROGRAMMER/ANALYST to analyze, design, develop, implement and maintain n/tier application software using Java, HTML, Cold Fusion, Java Script, ASP, IIS, MS Index Server, PERL, Web Authoring Tools, Oracle and MS SQL Server under UNIX and Windows NT operating systems. Require: B.S. degree in Computer Science, an Engineering discipline, or a closely related field with one year of experience in the job offered or as a Programmer. Extensive travel on assignments to various client sites within the U.S. is required. Competitive salary offered. Apply by resume to Vijay Vasandhara, President, Axiom Systems, Inc., 2550 Northwinds Parkway, Suite 440, Alpharetta, GA 30004. Attn: Job VK.

Software Engineer
Design, develop, maintain general /embedded software apps; analyze user needs and dev software solutions, design classes, modules, database; implement apps logic in programming languages; create software eng. process artifacts; use case specs, design docs, test plans and source code modules; use/deploy Unix/Linux OS, embedded realtime OS, RTU comm protocols, Java platform, C/C++ distrib.,sys tools, socket level, RMI/ X Windows, Tcl/Tk based GUI; scripting languages: Python. Req: B.S. Comp. Sci., Elec. Eng. or equiv and 5 yrs. exp. Job In Delray Beach, FL. Fax resume with code 2d3d-021 to 2d3d, Inc. to 561-278-7833.

Computers: System Project Directors needed: Plan, direct and coordinate systems project delivery. Lead teams on complex systems projects. Provide guidance on troubleshooting technical issues to enhance system functions. Experience must include two years working with Mainframe, COBOL and ASP. Requires MS/BS degree or equivalent and/or relevant work experience. Mail resume, references and salary requirements to: Investor's Bank & Trust, 200 Clarendon Street, Boston, MA 02116.

Programmer Analyst: wanted by IT Firm in Delaware. Must have Bachelors Degree in Computer or Electronics Engineering besides one year experience in design, install, configure & implement network, work and storage solutions utilizing EMC Symmetrix, Connectrix, Celerra File Server, Brocade DS 16B, McData ED-64M, ED-32M hardware with Software ESN Manager, EMC Control Center, Power Path, Fiber Cards and configuration in Solaris 2.6/7/8, HP-UX 10.x, SCO Unix, Linux 6.2/7.0, Windows 95/98/NT/2000 etc. Respond to HR Dept, Nextech Solutions Inc., 1170 Broadway Suite 314, New York, NY 10001

Ondeo Nalco Company, a world leader in water treatment and process chemicals, is looking for an individual to fill the following position to its company headquarters located in Naperville, Illinois: INFORMATION SYSTEMS SOLUTIONS DIRECTOR, responsible for business systems solutions and their architecture and integration with other business initiatives including across business processes and across applications. Bachelors in information systems, computer science, or a related field and seven years of experience including management of SAP implementations and systems upgrades required. Please fax resumes to I. Callum (630) 305-2983.

SENIOR PROGRAMMER/ANALYST to lead a team in the analysis, design, development, testing, maintenance and implementation of application software in a client/server environment for the retail industry using object oriented programming, GUI tools, MS Visual C++, MS SQL Server, C, C++ and Perl Scripting on Windows operating system. Require: B.S. degree in Computer Science/Engineering, or a closely related field with two years of experience in the job offered or as a Systems Analyst. Competitive salary offered. Apply by resume to: Frank Beaman, Global Software Development Services, Inc. 10 South Fifth St., Suite 600, Minneapolis, MN 55402. Attn: Job SG.

PROGRAMMER/ANALYST to analyze, design, develop and implement CRM solutions for customer call centers and help desk applications using Java, Vantive, Siebel, Kana, CORBA, Perl, COM, UNIX Shell Scripts, Oracle, ASP and HTML under Windows and UNIX operating systems. Require: B.S. degree in Computer Science/Engineering, or a closely related field with two years of experience in the job offered. Extensive travel on assignment to various client sites within the U.S. is required. Competitive salary offered. Apply by resume to: Saurabh Shah, Compuzard, Inc., 2884 Tennis Club Drive, Suite 702, West Palm Beach, FL 33417. Attn: Job PF

Premier Softech, Inc. has openings for Senior Programmer Analysts for positions in New Jersey and elsewhere with at least two years of experience in all of the following skills: MQSeries, CICS, Cobol, JCL, IMS, DB2, MVS. Positions require a Masters degree (equivalent degree and/or experience also acceptable). Must have legal authority to work in the US. Excellent pay and benefits. Mail resume w/proof of work status to: HR, Premier Softech, Inc., 200 Yarrow Circle, Dayton, NJ 08810 or email to jobs@premiersoftech.com

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Server Sprawl

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Lucero estimated that Conseco would have spent $332,000 to run 32 Windows servers on separate boxes. The total cost of ownership with the VMware-based environment is $142,000, he said.

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But the return will vary depending on a company's circumstances, Richardson warned. If a company has 100 servers that it has already paid for, its total cost of ownership may not necessarily be reduced after it buys 10 boxes plus VMware, he said.

"It's not clear it's going to change your server-to-system-administrator ratio," he said.

Carmine Iannace, manager of IT architecture at Welch Foods Inc. in Concord, Mass., sees benefit in the fact that applications aren't tied to a specific machine in the virtual server environment. Since the virtual server exists simply as a disk file on the host hardware, it's much easier for administrators to copy and replicate servers for high availability and disaster recovery, he said.

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Support Plans

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Microsoft also decided to make support consistent across its product lines, with the exception of consumer products such as Money and Encarta, which will get three years of mainstream support.

The rest of the products will receive mainstream support for a minimum of five years from the date of a product's general availability, with an option for a user to buy extended support for two more years.

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Support Plans

MAINSTREAM SUPPORT PHASE: Five years minimum
- Mainstream support includes no-charge incident support, paid incident support, support charged on an hourly basis, warranty claims and hot-fix support.

EXTENDED SUPPORT PHASE: Two years minimum
- May include assisted support charged on an hourly basis and hot-fix support. For nonsecurity extended hot-fix support, a contract must be purchased within 90 days of the end of a product's mainstream support phase.

ONLINE SELF-HELP SUPPORT: Eight years minimum

NOTE: Support plans are for business and development software.

Source: Microsoft Corp.

RESOURCE MANAGER
Go online for more on Microsoft's Windows System Resource Manager
QuickLink 33741
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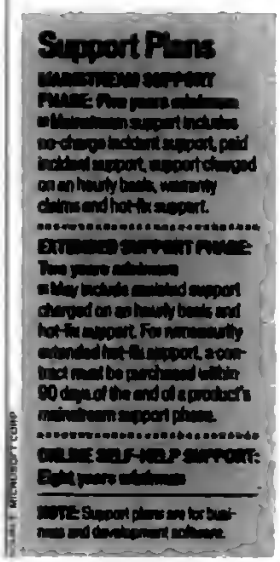
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RESOURCE MANAGER

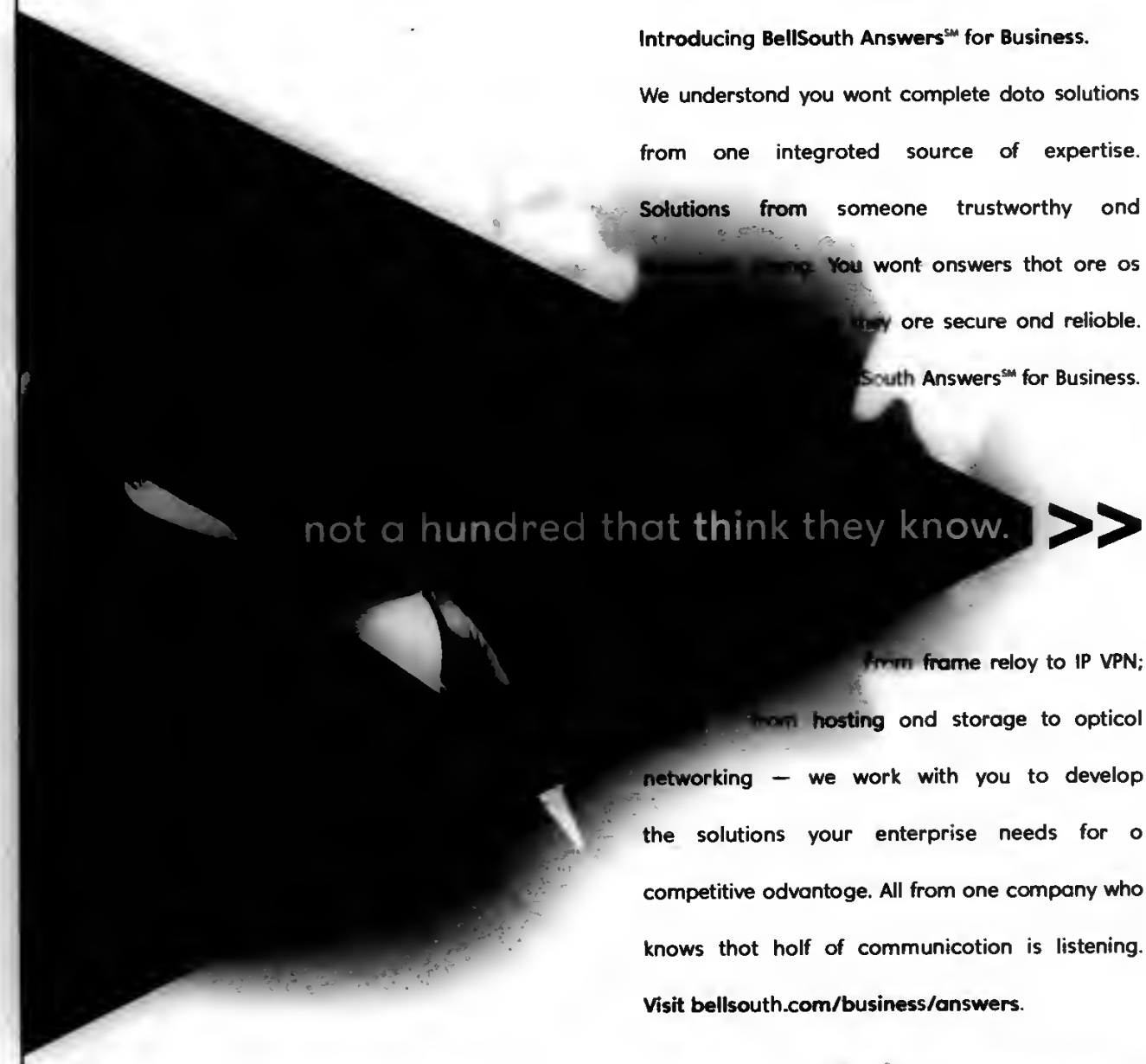
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FRANK HAYES ■ FRANKLY SPEAKING

Ghosts of Y2k

IT'S A LITTLE EARLY for Halloween this year, but the ghosts of Y2k are already making the rounds. Last week one materialized in Washington, where the city's new payroll data system, which went live in April 1999, was in the news. According to *The Washington Post*, the system cost $20 million, was already two years late when it was delivered and lasted just until early 2000 before being declared a disaster. Since then, the city has spent another $14 million trying to clean up the mess.

Note those dates: Behind schedule when it went live in 1999, a hopeless mess in 2000. They're telltale signs of Y2k ghosts.

D.C. has a long tradition of IT-related foul-ups that goes back long before Y2k. But for once, the city is not in a class by itself. Lots of other IT projects in both government and industry that were rushed into production in the months before the Y2k deadline have turned out to be dead on arrival — or at least at death's door.

That happened in Portland, Ore., where a water-department billing system project went horribly wrong and cost $10 million or more in lost cash flow [QuickLink 24681]. There were big headlines when balky new packaged applications cost Hershey Foods 19% of its quarterly profits three years ago. New Hampshire's prisons department, a New Jersey toy distributor and many others hit the same kind of problems.

It's not hard to figure out why. Y2k fixes for existing systems soaked up lots of IT talent in the late 1990s. The dot-com boom skimmed another layer of cream, as did desperate efforts by non-dot-coms to build their own Internet presence. Packaged enterprise applicatioos, supply chain automation and other hot technology projects grabbed still more warm bodies.

So when many organizations decided to junk antiquated systems and replace them as part of their Y2k programs, expertise was expensive and in short supply. As a result, corners were cut. Tests were skipped. Vendor salesmeo were trusted.

And when those projects ran late, 1999 was the furthest they could slip. Ready or oot, they went live. Shortly after that, many of them went brain-dead.

In case after case, the antiquated systems that were supposed to be junked had to be made Y2k-ready anyway — some as stopgaps until the new systems were finally really ready, otbers so the projects coold be rolled back eotirely and the new systems junked.

And it's oot over — oot by a long shot. Y2k may be gone, but its ghosts will haunt us in those systems for a long time.

If you're struggling with fixing one (or more) of these huge Y2k fiascos, you already know that. But if you're not, don't think Y2k's ghosts will leave you alone.

Remember those temporary fixes you made to applications in order to buy time as zero hour loomed? You found some of them in January 2001, when all the places you hard-coded "2000" stopped working properly. Did you really fix them, or just replace them with "2001" last year and "2002" this January?

What about places where you used "windowed" dates, where two-digit years refer to the 20th century in some cases and the 21st in others? Did you ever get around to fixing them for real? And if not, are you regularly adjusting those date windows?

And how about the work-arounds you sweet-talked users into accepting to help you get through the crisis? How many of those hoops do users still have to jump through? Is there a plan to clean them up?

Or did you forget about them, once zero hour was past and the Y2k budget dried up?

Doo't ignore them. Clean up those small problems. Complete those not-quite-finished fixes. Put your owo Y2k ghosts to rest, once and for all.

And be glad your IT shop isn't one of those that will be haunted by the ghosts of Y2k for years to come. ◗



FRANK HAYES, *Computerworld*'s senior news columnist, has covered IT for more than 20 years. Contact him at frank_hayes@computerworld.com.

SHARK TANK

Unclear on the Concept

Why won't these newly installed servers work? "They installed the servers in the racks first, then drilled some holes above them," reports service pilot fish diagnosing the trouble. "In doing so, they got some metal filings into the SCSI boards, which caused trouble." Trouble enough? Nope. "Then they proceeded to drill a few more holes," sighs fish. "Right through the hard drives."

It's a Disaster

Pilot fish is doing a full-scale evaluation for a disaster recovery plan, and he keeps asking his boss the same questions: Will there be an off-site recovery site? An off-site work area? Daily full backups? After weeks of nagging, he finally gets a response: The budget for anything off-site has been cut, and the answers are no, no and no. Then the boss has a question of his own: "So how is the disaster recovery plan coming?"

Get Him a Name Tag

This boss has constant problems with his network and mail passwords. "He'd either lock himself out and not be able to get into the network or would be unable to open his mail," says IT pilot fish. "We wound up having to remove the requirement for a network password, so he'd have only one to remember. What's worse is, both passwords were his first name."

It Doesn't Add Up

When a spreadsheet program isn't providing the right totals to some computations, pilot fish comes in to troubleshoot. "It turned out the lady using the spreadsheet didn't know how to make totals in Excel and was too timid to ask," fish sighs. "So she was hand-punching all the computations on a calculator – and just typing in the results."

Not Real Time

County's new geographic information system is a year in the making, complete with specially taken aerial photos. "At the demonstration, I try to impress a council member by zooming from the view of the entire county down to a car parked in his driveway," says IT pilot fish. "His astonished comment: 'Bradley said she was visiting her sister today!' "

Um, No Thanks

A minute before this meeting is scheduled to start, IT pilot fish gets user's laptop attached to the digital projector. Then the meeting's presenter hands fish his presentation – on a CD. "That's when I notice the laptop has no CD drive," sighs fish. "No problem," user says brightly. "I'll get my boombox. It has a CD player in it!"

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FRANK HAYES ■ FRANKLY SPEAKING

Ghosts of Y2k

IT'S A LITTLE EARLY for Halloween this year, but the ghosts of Y2k are already making the rounds. Last week one materialized in Washington, where the city's new payroll data system, which went live in April 1999, was in the news. According to *The Washington Post*, the system cost $20 million, was already two years late when it was delivered and lasted just until early 2000 before being declared a disaster. Since then, the city has spent another $14 million trying to clean up the mess.

Note those dates: Behind schedule when it went live in 1999, a hopeless mess in 2000. They're telltale signs of Y2k ghosts.

D.C. has a long tradition of IT-related foul-ups that goes back long before Y2k. But for once, the city is not in a class by itself. Lots of other IT projects in both government and industry that were rushed into production in the months before the Y2k deadline have turned out to be dead on arrival — or at least at death's door.

That happened in Portland, Ore., where a water-department billing system project went horribly wrong and cost $10 million or more in lost cash flow [QuickLink 24681]. There were big headlines when balky new packaged applications cost Hershey Foods 19% of its quarterly profits three years ago. New Hampshire's prisons department, a New Jersey toy distributor and many others hit the same kind of problems.

It's not hard to figure out why. Y2k fixes for existing systems soaked up lots of IT talent in the late 1990s. The dot-com boom skimmed another layer of cream, as did desperate efforts by non-dot-coms to build their own Internet presence. Packaged enterprise applications, supply chain automation and other hot technology projects grabbed still more warm bodies.

So when many organizations decided to junk antiquated systems and replace them as part of their Y2k programs, expertise was expensive and in short supply. As a result, corners were cut. Tests were skipped. Vendor salesmen were trusted.



And when those projects ran late, 1999 was the furthest they could slip. Ready or not, they went live. Shortly after that, many of them went brain-dead.

In case after case, the antiquated systems that were supposed to be junked had to be made Y2k-ready anyway — some as stopgaps until the new systems were finally really ready, others so the projects could be rolled back entirely and the new systems junked.

And it's not over — not by a long shot. Y2k may be gone, but its ghosts will haunt us in those systems for a long time.

If you're struggling with fixing one (or more) of these huge Y2k fiascos, you already know that. But if you're not, don't think Y2k's ghosts will leave you alone.

Remember those temporary fixes you made to applications in order to buy time as zero hour loomed? You found some of them in January 2001, when all the places you hard-coded "2000" stopped working properly. Did you really fix them, or just replace them with "2001" last year and "2002" this January?

What about places where you used "windowed" dates, where two-digit years refer to the 20th century in some cases and the 21st in others? Did you ever get around to fixing them for real? And if not, are you regularly adjusting those date windows?

And how about the work-arounds you sweet-talked users into accepting to help you get through the crisis? How many of those hoops do users still have to jump through? Is there a plan to clean them up?

Or did you forget about them, once zero hour was past and the Y2k budget dried up?

Don't ignore them. Clean up those small problems. Complete those not-quite-finished fixes. Put your own Y2k ghosts to rest, once and for all.

And be glad your IT shop isn't one of those that will be haunted by the ghosts of Y2k for years to come. ◗



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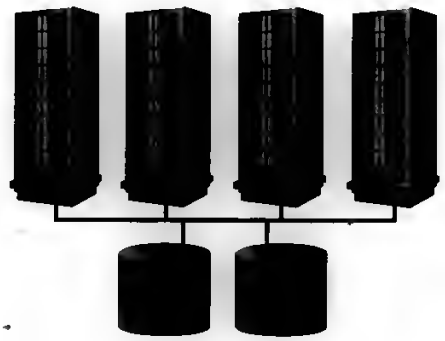
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